Montana Department of
ENVIRONMENTAL QUALITY
Brian Schweitzer, Governor
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October 31, 2011

Henry Bogert
Butte Highlands Joint Venture
P.O. Box 4959
Butte, MT 59702

Dear Mr. Bogert:

Montana Air Quality Permit #4449-03 is deemed final as of October 29, 2011, by the Department of Environmental Quality (Department). This permit is for an underground gold mine. All conditions of the Department's Decision remain the same. Enclosed is a copy of your permit with the final date indicated.

For the Department,

Vickie Walsh
Air Permitting Program Supervisor
Air Resources Management Bureau
(406) 444-9741

Ed Warner
Environmental Engineer
Air Resources Management Bureau
(406) 444-2467

VW:EW
Enclosure

Montana Department of Environmental Quality
Permitting and Compliance Division

Montana Air Quality Permit #4449-03

Butte Highlands Joint Venture
P.O. Box 4959
Butte, MT 59702

October 29, 2011

MONTANA AIR QUALITY PERMIT

Issued To: Butte Highlands Joint Venture
P.O. Box 4959
Butte, MT 59702

Montana Air Quality Permit: #4449-03
Application Complete: 8/31/11
Preliminary Determination Issued: 9/27/11
Department's Decision Issued: 10/13/11
Permit Final: 10/29/11
AFS #: 093-0020

A Montana Air Quality Permit (MAQP), with conditions, is hereby granted to Butte Highlands Joint Venture (BHJV), pursuant to Sections 75-2-204 and 211 of the Montana Code Annotated (MCA), as amended, and Administrative Rules of Montana (ARM) 17.8.740, *et seq*., as amended, for the following:

SECTION I: Permitted Facilities

A. Plant Location

The BHJV is located on Sections 31 and 32, Township 1 North, Range 7 West, in Silver Bow County, Montana.

B. Current Permit Action

On January 5, 2011, the Montana Department of Environmental Quality – Air Resources Management Bureau (Department) received an application from BHJV to update the MAQP to reflect changes in operations from exploration activities to mining of gold ore. The changes requested were to increase the production capacity to 730,000 tons per year of combined ore and production rock, to add a 500 tons per hour (TPH) aggregate screen powered by a 100-brake horsepower (bhp) diesel engine, a 150 TPH aggregate crusher powered by a 350-bhp diesel engine, a 1,502-bhp diesel generator engine, a 540-bhp diesel air compressor engine, and two 15,000-gallon diesel storage tanks. A 275-bhp diesel air compressor engine and an 8,000 gallon diesel storage tank are being removed from the MAQP. The current permitting action updates the permit conditions, equipment list, and emission inventory to reflect the new operations.

SECTION II: Conditions and Limitations

A. Emission Limitations

1. BHJV shall operate and maintain a fabric filter baghouse on the cement storage silo exhaust stack for controlling particulate matter (PM) emissions (ARM 17.8.752).

2. The maximum combined ore and production rock throughput shall be limited to 730,000 tons per any 12-month rolling period (ARM 17.8.749).

3. BHJV may only operate the following nonroad diesel engines (ARM 17.8.749):

a. One or more diesel generator engines that individually have a minimum rated design capacity of at least 300-bhp and when combined have a maximum rated engine design capacity not to exceed 1,475-bhp with United States Environmental Protection Agency (USEPA) nonroad engine certifications of Tier 2 or better as tabulated in 40 Code of Federal Regulations (CFR) 89.112.

b. One diesel generator engine with a maximum rated engine design capacity not to exceed 1,502-bhp with an USEPA nonroad engine certification of Tier 2 or better as tabulated in 40 CFR 89.112.

c. One diesel air compressor engine with a maximum rated engine design capacity not to exceed 540-bhp with an USEPA nonroad engine certification of Tier 3 or better as tabulated in 40 CFR 89.112.

d. One diesel engine for a welder with a maximum rated engine design capacity not to exceed 26-bhp with an USEPA nonroad engine certification of Tier 2 or better as tabulated in 40 CFR 89.112.

e. One diesel engine for a crusher with a maximum rated engine design capacity not to exceed 350-bhp with an USEPA nonroad engine certification of Tier 3 or better as tabulated in 40 CFR 89.112.

f. One diesel engine for a screen with a maximum rated engine design capacity not to exceed 100.4-bhp with an USEPA nonroad engine certification of Tier 3 or better as tabulated in 40 CFR 89.112.

4. For the engines in Section II.A.3, BHJV shall only burn diesel fuel that is compliant with 40 CFR 80.510(b) having a sulfur content no greater than 0.0015% (15 parts per million) by weight (ARM 17.8.752).

5. The diesel generator engine with a maximum rated engine design capacity not to exceed 1,502-bhp referenced in Section II.A.3.b shall have an exhaust stack height of 12.5 feet from ground level and an exhaust stack exit diameter of 10 inches (ARM 17.8.749).

6. BHJV shall not operate more than one crusher at any given time and the maximum rated design capacity of the crusher shall not exceed 150 TPH (ARM 17.8.749).

7. BHJV shall not operate more than one screen at any given time and the maximum rated design capacity of the screen shall not exceed 500 TPH (ARM 17.8.749).

8. BHJV shall not cause or authorize emissions to be discharged into the outdoor atmosphere an opacity of 20% or greater averaged over 6 consecutive minutes from the crusher or screen (ARM 17.8.304 and ARM 17.8.752).

9. Water and spray bars shall be available on-site at all times and operated as necessary to maintain compliance with the opacity limitations in Section II.A.8 (ARM 17.8.752).

10. BHJV shall not cause or authorize the use of any street, road, or parking lot without taking reasonable precautions to control emissions of airborne particulate matter (ARM 17.8.308).

11. BHJV shall treat all unpaved portions of the haul roads, access roads, parking lots, or general plant area with water and/or chemical dust suppressant as necessary to maintain compliance with the reasonable precautions limitation in Section II.A.10 (ARM 17.8.749 and ARM 17.8.752).

12. BHJV shall comply with all applicable standards and limitations, and the reporting, recordkeeping, and notification requirements contained in 40 Code of Federal Regulations (CFR) 60, Subpart IIII, *Standards of Performance for Stationary Compression Ignition Internal Combustion Engines* and 40 CFR 63, Subpart ZZZZ, *National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines*, for any applicable diesel engine (ARM 17.8.340; 40 CFR 60, Subpart IIII; ARM 17.8.342 and 40 CFR 63, Subpart ZZZZ).

B. Testing Requirements

1. All compliance source tests shall conform to the requirements of the Montana Source Test Protocol and Procedures Manual (ARM 17.8.106).

2. The Department may require further testing (ARM 17.8.105).

C. Operational Reporting Requirements

1. BHJV shall supply the Department with annual production information for all emission points, as required by the Department in the annual emission inventory request. The request will include, but is not limited to, all sources of emissions identified in the emission inventory contained in the permit analysis.

   Production information shall be gathered on a calendar-year basis and submitted to the Department by the date required in the emission inventory request. Information shall be in the units required by the Department. This information may be used to calculate operating fees, based on actual emissions from the facility, and/or to verify compliance with permit limitations (ARM 17.8.505).

2. BHJV shall notify the Department of any construction or improvement project conducted, pursuant to ARM 17.8.745, that would include ***the addition of a new emissions unit***, change in control equipment, stack height, stack diameter, stack flow, stack gas temperature, source location, or fuel specifications, or would result in an increase in source capacity above its permitted operation. The notice must be submitted to the Department, in writing, 10 days prior to startup or use of the proposed de minimis change, or as soon as reasonably practicable in the event of an unanticipated circumstance causing the de minimis change, and must include the information requested in ARM 17.8.745(l)(d) (ARM 17.8.745).

3. All records compiled in accordance with this permit must be maintained by BHJV as a permanent business record for at least 5 years following the date of the measurement, must be available at the plant site for inspection by the Department, and must be submitted to the Department upon request (ARM 17.8.749).

4. BHJV shall document, by month, the throughput of ore and production rock production. By the 25th day of each month, BHJV shall total the ore and production rock throughput for the previous month. The monthly information will be used to verify compliance with the rolling 12-month limitation in Section II.A.2. The information for each of the previous months shall be submitted along with the annual emission inventory (ARM 17.8.749).

5. BHJV shall have available onsite at all times documentation for the diesel engines that verifies their compliance with the applicable USEPA nonroad compression-ignition engine emission standards as described in Section II.A.3 (ARM 17.8.749).

D. Notification

   BHJV shall provide the Department with written notification of the actual start-up date of the new engines within 15 days after the actual start-up date (ARM 17.8.749).

SECTION III: General Conditions

A. Inspection – BHJV shall allow the Department's representatives access to the source at all reasonable times for the purpose of making inspections or surveys, collecting samples, obtaining data, auditing any monitoring equipment or observing any monitoring or testing, and otherwise conducting all necessary functions related to this permit.

B. Waiver – The permit and the terms, conditions, and matters stated herein shall be deemed accepted if BHJV fails to appeal as indicated below.

C. Compliance with Statutes and Regulations – Nothing in this permit shall be construed as relieving BHJV of the responsibility for complying with any applicable federal or Montana statute, rule, or standard, except as specifically provided in ARM 17.8.740, *et seq.* (ARM 17.8.756).

D. Enforcement – Violations of limitations, conditions and requirements contained herein may constitute grounds for permit revocation, penalties, or other enforcement action as specified in Section 75-2-401, *et seq*., MCA.

E. Appeals – Any person or persons jointly or severally adversely affected by the Department's decision may request, within 15 days after the Department renders its decision, upon affidavit setting forth the grounds therefore, a hearing before the Board of Environmental Review (Board). A hearing shall be held under the provisions of the Montana Administrative Procedures Act. The filing of a request for a hearing does not stay the Department's decision, unless the Board issues a stay upon receipt of a petition and a finding that a stay is appropriate under Section 75-2-211(11)(b), MCA. The issuance of a stay on a permit by the Board postpones the effective date of the Department's decision until conclusion of the hearing and issuance of a final decision by the Board. If a stay is not issued by the Board, the Department's decision on the application is final 16 days after the Department's decision is made.

F. Permit Inspection – As required by ARM 17.8.755, Inspection of Permit, a copy of the air quality permit shall be made available for inspection by the Department at the location of the source.

G. Permit Fee – Pursuant to Section 75-2-220, MCA, failure to pay the annual operation fee by BHJV may be grounds for revocation of this permit, as required by that section and rules adopted thereunder by the Board.

H. Duration of Permit – Construction or installation must begin or contractual obligations entered into that would constitute substantial loss within 3 years of permit issuance and proceed with due diligence until the project is complete or the permit shall expire (ARM 17.8.762).

Montana Air Quality Permit (MAQP) Analysis
Butte Highlands Joint Venture – Butte Highlands Project
MAQP #4449-03

I. Introduction/Process Description

Butte Highlands Joint Venture (BHJV) operates an underground gold ore mine with a maximum extraction capacity not to exceed 2,000 tons per day (730,000 tons per year (TPY)) of combined gold ore and production rock. The facility is located in Sections 31 and 32 in Township 1 North, Range 7 West.

A. Permitted Equipment

The equipment covered by this MAQP consists of:

- Cement storage silo with a baghouse on the silo exhaust;
- Shotcrete cement plant;
- Cement Rock Fill plant;
- United States Environmental Protection Agency (USEPA) Tier 2 (or better) certified diesel-fired generator engines with a total combined capacity not to exceed 1,475-brake horsepower (bhp) (currently a Tier 3 563-bhp Caterpillar C15 DITA 365-kilowatt (kW) generator set and a Tier 3 546-bhp Caterpillar C15 DITA 350-kW generator set);
- A USEPA Tier 2 (or better) certified diesel generator engine not to exceed 1,502-bhp (currently a Tier 2 1,502-bhp Caterpillar C32 DITA 1,000-kW generator set);
- A USEPA Tier 3 (or better) certified diesel air compressor engine not to exceed 540-bhp (currently a Tier 3 540-bhp Caterpillar C15 DITA);
- A USEPA Tier 2 (or better) certified diesel engine for a welder not to exceed 26-bhp (currently a Tier 2 26-bhp Kubota);
- A 150 ton per hour (TPH) crusher powered by a USEPA Tier 3 (or better) certified diesel engine not to exceed 350-bhp (currently an Extec C-12+ with a Tier 3 350-bhp Caterpillar C9 engine);
- A 500 TPH screen powered by a USEPA Tier 3 certified diesel engine not to exceed 100.4-bhp (currently an Extec QE140 Robotrac with a Tier 3 100.4-bhp Deutz TCD2012L04 engine); and
- One 6,000-gallon and two 15,000-gallon diesel storage tanks.

B. Source Description

The BHJV is an underground gold ore mining operation. Emissions-generating activities include wet drilling and blasting using an emulsion blasting agent underground to liberate up to 2,000 tons per day (730,000 TPY) of gold ore and production rock. These materials are loaded and transported to the surface. The emissions associated with the underground activities are vented to the outside atmosphere via the primary portal. On the surface the raw ore may be crushed and screened, then stored in a temporary stockpile for eventual loading with a front-end-loader to haul trucks for transport off site. Production rock is unloaded to a permanent waste rock stockpile and the active area of that pile is subject to wind erosion. All the gold ore is to be hauled off site; therefore, no extraction of gold from the ore takes place at BHJV.

A cement rock fill (CRF) plant and a shotcrete plant supply CRF and shotcrete to underground operations, and require concrete, aggregate (sand for shotcrete plant, development rock for CRF plant), and water. A silo is located at the site to store bulk cement used either in the CRF plant and/or shotcrete plant. The cement silo is equipped with a baghouse to reduce emissions during

cement loading and unloading activities. The silo, CRF plant, and shotcrete plant are located near the mine portal. Sand and aggregate are loaded into hoppers using a front-end-loader. The end products are transported underground via truck.

There are several nonroad diesel-fired internal combustion engines in use at the facility. Diesel-fired generator sets provide electricity for the facility operations. There are currently three generator sets that have maximum size ratings of 1,502-bhp, 563-bhp, and 546-bhp. Other diesel-fired combustion equipment include an air compressor (up to 540-bhp), a welder (up to 26-bhp), a 350-bhp diesel engine that powers a150 TPH crusher, and a 100.4-bhp diesel engine that powers a 500 TPH screen. All of the diesel engines must be compliant with EPA nonroad compression ignition engine emissions standards.

One 6,000 gallon and two 15,000 gallon diesel fuel storage tanks are present at the site.

C. Permit History

On July 22, 2009, the Department of Environmental Quality – Air Resources Management Bureau (Department) received a complete application from Timberline Resources Corporation (TRC). The application was for an underground exploration project consisting of drifting, ore recovery for bulk sampling, and development rock removal and storage. On October 6, 2009, TRC was issued **MAQP #4449-00** for the underground exploration project known as the Butte Highlands Project (BHP).

On February 22, 2010, the Department received a letter from TRC indicating that they were unable to obtain the Caterpillar DM9081 diesel engine/generator set that was to be the facility's primary generator. TRC proposed to use a different diesel engine/generator set in place of the Caterpillar DM9081. MAQP #4449-00 was written using emission factors specific to the Caterpillar DM9081 engine and therefore required the use of a Caterpillar DM9081 engine for a primary generator set. The Department replied on March 29, 2010, that the use of the replacement diesel engine/generator would violate the conditions of MAQP #4449-00 because it was not the specific diesel engine/generator described in the MAQP and the potential emissions from the proposed diesel engine/generator were greater than the de minimis threshold. Replacing the Caterpillar DM9081 generator set with the proposed engine would require a permit modification. The Department received the permit modification request and application fee from TRC on April 7, 2010, and the Affidavit of Public Notice on April 21. 2010. This permit action removed the Caterpillar DM9081 engine from the permit, changed the primary generator engine language to be more de minimis-friendly, updated the Emissions Inventory with the new primary generator set, removed the emergency backup designation from the secondary diesel generator engine to allow for more operational flexibility with hours of operation, and corrected some typographical errors in the Emissions Inventory from MAQP #4449-00. **MAQP #4449-01** became final on May 26, 2010, and replaced MAQP #4449-00.

On November 5, 2010, the Department received an application from BHJV requesting to change the ownership name from TRC to BHJV and to notify the Department that the primary and secondary diesel generator sets were being replaced with two new diesel generator sets. The engines associated with these generators have maximum rated design capacities of 563-bhp and 546-bhp and are certified to USEPA Tier 3 emission standards. This permitting action changed the wording of the permit conditions regarding diesel generator engines so that BHJV could use one or more diesel generator engines that individually had a minimum rated design capacity of at least 300-bhp and when combined had a maximum rated capacity not to exceed 1,475-bhp that are compliant with USEPA Tier 2 or better emission standards. This change was an administrative amendment in accordance with the Administrative Rules of Montana

(ARM) 17.8.764(1)(b) because there were no proposed increases in potential emissions. This action also changed the ownership of the facility from TRC to BHJV. **MAQP #4449-02** became final on December 21, 2010, and replaced MAQP #4449-01.

D. Current Permit Action

On January 6, 2011, the Department received an application from AMEC Earth and Environmental, Inc. (AMEC) on behalf of BHJV for a permit modification. The modification addresses the changes in operations from exploration activities to the mining of gold ore. The permit modification includes increases in daily and annual aggregate throughputs to 2,000 tons per day (730,000 TPY) of combined gold ore and production rock, the corresponding increases in activities associated with the increase in throughput (blasting, loading, unloading, and haul road traffic), the addition of a 150 TPH crusher powered by a 350-bhp diesel engine, a 500 TPH screen powered by a 100-bhp diesel engine, a new generator powered by a 1,502-bhp diesel engine, an upgraded air compressor powered by a 540-bhp diesel engine, and two 15,000 gallon diesel storage tanks. Equipment to be removed from the permit are a 275-bhp diesel engine from the old air compressor and an 8,000 gallon diesel storage tank that had been included in the original permit but had never been installed.

The emission inventory submitted with the permit application indicated potential emissions above 100 TPY of nitrogen oxides (NO_x) and above 50 TPY of sulfur dioxide (SO_2); therefore, the Department required air dispersion modeling to verify compliance with nitrogen dioxide (NO_2) and SO_2 ambient air quality standards. On January 18, 2011, the Department sent an incompleteness letter to AMEC which required the submittal of the affidavit of publication of public notice, air dispersion modeling, and an emission inventory of the greenhouse gases (GHG) for the facility.

On March 10, 2011, the Department received and granted a request from AMEC for a deadline extension until May 30, 2011, for the submittal of the incompleteness items.

On April 25, 2011, the Department received correspondence from AMEC that provided updated emissions inventory information regarding the sulfur content of the diesel fuel that would be used at the facility and a greenhouse gas inventory that demonstrated that this facility would not exceed the major source thresholds established in the USEPA "Tailoring Rule". Also received on April 25, 2011, was an ambient air dispersion modeling protocol.

On May 5, 2011, the Department provided AMEC with a list of issues that needed addressing regarding the air dispersion modeling protocol. Based on the updated levels of SO_2 emissions, no air dispersion modeling for SO_2 would be required. The modeling need only address the NO_x emissions.

On May 24, 2011, the Department received a request from AMEC for a deadline extension for the submission of incompleteness items. The remaining outstanding incompleteness items were the issues identified with the air dispersion modeling protocol. The Department granted the extension on May 27, 2011, and provided a new deadline of July 31, 2011.

On June 30, 2011, the Department received electronic correspondence from AMEC with new proposed modeling parameters and emission scenario information for the air dispersion modeling protocol. A hard copy of this correspondence was received on July 5, 2011. The Department did not agree to the following proposals from the June 30, 2011, correspondence:

1. Modeling the diesel generator engine emissions at an emission rate corresponding to 75% load because actual expected average loads of the generators would be approximately 66% rather than 100%. Typical modeling demonstrations must be performed based on worse-case source emission rates that are typically found at 100% load conditions.

2. Using non-default in-stack nitrogen dioxide/nitrogen oxides (NO_2/NO_x) ratios for various engine emissions. AMEC referenced data provided by the San Joaquin Valley Air Pollution Control District (SJVAPCD) which indicated a default ratio for diesel engines of 0.20 and a specific ratio of 0.1564 based on test data from a 322-bhp diesel water pump engine. USEPA recommends a default value of 0.80 in instances without additional justification for a non-default value. USEPA also recommends acceptance of 0.50 as a default in-stack NO_2/NO_x ratio for input to the Plume Volume Molar Ratio Method (PVMRM) and Ozone Limiting Method (OLM) options within the modeling software AERMOD, in the absence of more appropriate source-specific information.

On July 18, 2011, the Department responded to AMEC's proposals in a letter stating that for proposal 1 above, the MAQP must ultimately reflect the emission rates used in the modeling demonstration. Therefore, a modeling demonstration using emissions rates corresponding to 75% load would require that the MAQP limit the sources to no more than 75% load. The response to proposal 2 above was that the Department would not accept the 0.1564 NO_2/NO_x ratio because it is based on data from a specific engine that does not correspond to the proposed engines in this project. The Department would accept the suggested in-stack default ratio for diesel engines of 0.20. In this correspondence the Department stated that the air dispersion modeling demonstration need only account for the NO_x emissions from the new equipment proposed in the current permitting action. This would consist of the 540-bhp air compressor diesel engine, the 350-bhp crusher diesel engine, the 100-bhp screen diesel engine, and the 1,502-bhp generator diesel engine. This decision was based on the fact that this mine is an existing permitted source that has complied with the air permitting regulations since its inception, the qualitative ambient air impact analyses performed in the previous permitting actions determined that the existing sources would not violate ambient air quality standards, the location of the mine is designated as unclassifiable/attainment for NO_2, and this mine is a minor source of emissions with respect to New Source Review (NSR)/Prevention of Significant Deterioration (PSD) permitting and does not require an Environmental Impact Assessment (EIS).

On July 22, 2011, the Department received electronic correspondence from AMEC requesting a deadline extension for the updates to the ambient air dispersion modeling protocol. The Department granted the extension on July 25, 2011, and provided a new deadline of August 31, 2011.

On August 31, 2011, the Department received an air dispersion modeling report from AMEC, and the Department considered the application complete. This report addressed the comments that the Department had identified with the modeling protocol and indicated that the proposed action did not cause or contribute to any violations of the NO_2 ambient air quality standards.

This permitting action incorporates the proposed new equipment and productions rates. **MAQP #4449-03** replaces #4449-02.

II. Applicable Rules and Regulations

The following are partial explanations of some applicable rules and regulations that apply to the facility. The complete rules are stated in the ARM and are available, upon request, from the Department. Upon request, the Department will provide references for location of complete copies of all applicable rules and regulations or copies where appropriate.

A. ARM 17.8, Subchapter 1 – General Provisions, including but not limited to:

1. ARM 17.8.101 Definitions. This rule includes a list of applicable definitions used in this chapter, unless indicated otherwise in a specific subchapter.

2. ARM 17.8.105 Testing Requirements. Any person or persons responsible for the emission of any air contaminant into the outdoor atmosphere shall, upon written request of the Department, provide the facilities and necessary equipment (including instruments and sensing devices) and shall conduct tests, emission or ambient, for such periods of time as may be necessary using methods approved by the Department.

3. ARM 17.8.106 Source Testing Protocol. The requirements of this rule apply to any emission source testing conducted by the Department, any source or other entity as required by any rule in this chapter, or any permit or order issued pursuant to this chapter, or the provisions of the Clean Air Act of Montana, 75-2-101, *et seq*., Montana Code Annotated (MCA).

   BHJV shall comply with the requirements contained in the Montana Source Test Protocol and Procedures Manual, including, but not limited to, using the proper test methods and supplying the required reports. A copy of the Montana Source Test Protocol and Procedures Manual is available from the Department upon request.

4. ARM 17.8.110 Malfunctions. (2) The Department must be notified promptly by telephone whenever a malfunction occurs that can be expected to create emissions in excess of any applicable emission limitation or to continue for a period greater than 4 hours.

5. ARM 17.8.111 Circumvention. (1) No person shall cause or permit the installation or use of any device or any means that, without resulting in reduction of the total amount of air contaminant emitted, conceals or dilutes an emission of air contaminant that would otherwise violate an air pollution control regulation. (2) No equipment that may produce emissions shall be operated or maintained in such a manner as to create a public nuisance.

B. ARM 17.8, Subchapter 2 – Ambient Air Quality, including, but not limited to the following:

1. ARM 17.8.204 Ambient Air Monitoring
2. ARM 17.8.210 Ambient Air Quality Standards for Sulfur Dioxide
3. ARM 17.8.211 Ambient Air Quality Standards for Nitrogen Dioxide
4. ARM 17.8.212 Ambient Air Quality Standards for Carbon Monoxide
5. ARM 17.8.213 Ambient Air Quality Standard for Ozone
6. ARM 17.8.214 Ambient Air Quality Standard for Hydrogen Sulfide
7. ARM 17.8.220 Ambient Air Quality Standard for Settled Particulate Matter
8. ARM 17.8.221 Ambient Air Quality Standard for Visibility
9. ARM 17.8.222 Ambient Air Quality Standard for Lead
10. ARM 17.8.223 Ambient Air Quality Standard for Particulate Matter with an aerodynamic diameter of 10 microns or less (PM_{10})

BHJV must maintain compliance with the applicable ambient air quality standards.

C. ARM 17.8, Subchapter 3 – Emission Standards, including, but not limited to:

1. ARM 17.8.304 Visible Air Contaminants. This rule requires that no person may cause or authorize emissions to be discharged into the outdoor atmosphere from any source installed after November 23, 1968, that exhibit an opacity of 20% or greater averaged over 6 consecutive minutes.

2. ARM 17.8.308 Particulate Matter, Airborne. (1) This rule requires an opacity limitation of less than 20% for all fugitive emission sources and that reasonable precautions be taken to control emissions of airborne particulate matter. (2) Under this rule, BHJV shall not cause or authorize the use of any street, road, or parking lot without taking reasonable precautions to control emissions of airborne particulate matter.

3. ARM 17.8.309 Particulate Matter, Fuel Burning Equipment. This rule requires that no person shall cause, allow, or permit to be discharged into the atmosphere particulate matter caused by the combustion of fuel in excess of the amount determined by this rule.

4. ARM 17.8.310 Particulate Matter, Industrial Process. This rule requires that no person shall cause, allow, or permit to be discharged into the atmosphere particulate matter in excess of the amount set forth in this rule.

5. ARM 17.8.322 Sulfur Oxide Emissions--Sulfur in Fuel. This rule requires that no person shall burn liquid, solid, or gaseous fuel in excess of the amount set forth in this rule.

6. ARM 17.8.324 Hydrocarbon Emissions--Petroleum Products. (3) No person shall load or permit the loading of gasoline into any stationary tank with a capacity of 250 gallons or more from any tank truck or trailer, except through a permanent submerged fill pipe, unless such tank is equipped with a vapor loss control device as described in (1) of this rule.

7. ARM 17.8.340 Standard of Performance for New Stationary Sources and Emission Guidelines for Existing Sources. This rule incorporates, by reference, 40 Code of Federal Regulations (CFR) Part 60, Standards of Performance for New Stationary Sources (NSPS). BHJV is considered an NSPS affected facility under 40 CFR Part 60 and subject to the requirements of the following subparts.

   a. 40 CFR 60, Subpart A – General Provisions apply to all equipment or facilities subject to an NSPS Subpart as listed below:

   b. 40 CFR 60, Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines. This subpart applies to the stationary diesel engines manufactured after July 11, 2005.

8. ARM 17.8.342 Emission Standards for Hazardous Air Pollutants for Source Categories. The source, as defined and applied in 40 CFR Part 63, is required to comply with the requirements of 40 CFR Part 63, as listed below:

   a. 40 CFR 63, Subpart A – General Provisions apply to all equipment or facilities subject to a National Emission Standard for Hazardous Air Pollutants (NESHAP) Subpart as listed below:

   b. 40 CFR 63, Subpart ZZZZ - National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines. The BHP is an area source of hazardous air pollutants (HAP); therefore, the stationary diesel engines are subject to this rule.

D. ARM 17.8, Subchapter 5 – Air Quality Permit Application, Operation, and Open Burning Fees, including, but not limited to:

1. ARM 17.8.504 Air Quality Permit Application Fees. This rule requires that an applicant submit an air quality permit application fee concurrent with the submittal of an air quality permit application. A permit application is incomplete until the proper application fee is paid to the Department. BHJV submitted the appropriate permit application fee for the current permit action.

2. ARM 17.8.505 Air Quality Operation Fees. An annual air quality operation fee must, as a condition of continued operation, be submitted to the Department by each source of air contaminants holding an air quality permit (excluding an open burning permit) issued by the Department. The air quality operation fee is based on the actual or estimated actual amount of air pollutants emitted during the previous calendar year.

   An air quality operation fee is separate and distinct from an air quality permit application fee. The annual assessment and collection of the air quality operation fee, described above, shall take place on a calendar-year basis. The Department may insert into any final permit issued after the effective date of these rules, such conditions as may be necessary to require the payment of an air quality operation fee on a calendar-year basis, including provisions that prorate the required fee amount.

E. ARM 17.8, Subchapter 7 – Permit, Construction, and Operation of Air Contaminant Sources, including, but not limited to:

1. ARM 17.8.740 Definitions. This rule is a list of applicable definitions used in this chapter, unless indicated otherwise in a specific subchapter.

2. ARM 17.8.743 Montana Air Quality Permits--When Required. This rule requires a person to obtain an air quality permit or permit modification to construct, modify, or use any air contaminant sources that have the potential to emit (PTE) greater than 25 tons per year of any pollutant. BHJV has a PTE greater than 25 tons per year of particulate matter (PM), PM_{10}, NO_x, and carbon monoxide (CO); therefore, an air quality permit is required.

3. ARM 17.8.744 Montana Air Quality Permits--General Exclusions. This rule identifies the activities that are not subject to the Montana Air Quality Permit program.

4. ARM 17.8.745 Montana Air Quality Permits--Exclusion for De Minimis Changes. This rule identifies the de minimis changes at permitted facilities that do not require a permit under the Montana Air Quality Permit Program.

5. ARM 17.8.748 New or Modified Emitting Units--Permit Application Requirements. (1) This rule requires that a permit application be submitted prior to installation, modification, or use of a source. A permit application was not required for this action because it is an administrative amendment. (7) This rule requires that the applicant notify the public by means of legal publication in a newspaper of general circulation in the area affected by the application for a permit. BHJV submitted an affidavit of publication of public notice for the January 6, 2011, issue of the *Montana Standard*, a newspaper of general circulation in the Town of Butte in Silver Bow County, as proof of compliance with the public notice requirements.

6. ARM 17.8.749 Conditions for Issuance or Denial of Permit. This rule requires that the permits issued by the Department must authorize the construction and operation of the facility or emitting unit subject to the conditions in the permit and the requirements of this subchapter. This rule also requires that the permit must contain any conditions necessary to assure compliance with the Federal Clean Air Act (FCAA), the Clean Air Act of Montana, and rules adopted under those acts.

7. ARM 17.8.752 Emission Control Requirements. This rule requires a source to install the maximum air pollution control capability that is technically practicable and economically feasible, except that Best Available Control Technology (BACT) shall be utilized. The required BACT analysis is included in Section III of this permit analysis.

8. ARM 17.8.755 Inspection of Permit. This rule requires that air quality permits shall be made available for inspection by the Department at the location of the source.

9. ARM 17.8.756 Compliance with Other Requirements. This rule states that nothing in the permit shall be construed as relieving BHJV of the responsibility for complying with any applicable federal or Montana statute, rule, or standard, except as specifically provided in ARM 17.8.740, *et seq*.

10. ARM 17.8.759 Review of Permit Applications. This rule describes the Department's responsibilities for processing permit applications and making permit decisions on those permit applications that do not require the preparation of an environmental impact statement.

11. ARM 17.8.762 Duration of Permit. An air quality permit shall be valid until revoked or modified, as provided in this subchapter, except that a permit issued prior to construction of a new or modified source may contain a condition providing that the permit will expire unless construction is commenced within the time specified in the permit, which in no event may be less than 1 year after the permit is issued.

12. ARM 17.8.763 Revocation of Permit. An air quality permit may be revoked upon written request of the permittee, or for violations of any requirement of the Clean Air Act of Montana, rules adopted under the Clean Air Act of Montana, the FCAA, rules adopted under the FCAA, or any applicable requirement contained in the Montana State Implementation Plan (SIP).

13. ARM 17.8.764 Administrative Amendment to Permit. An air quality permit may be amended for changes in any applicable rules and standards adopted by the Board of Environmental Review (Board) or changed conditions of operation at a source or stack that do not result in an increase of emissions as a result of those changed conditions. The owner or operator of a facility may not increase the facility's emissions beyond permit limits unless the increase meets the criteria in ARM 17.8.745 for a de minimis change not requiring a permit, or unless the owner or operator applies for and receives another permit in accordance with ARM 17.8.748, ARM 17.8.749, ARM 17.8.752, ARM 17.8.755, and ARM 17.8.756, and with all applicable requirements in ARM Title 17, Chapter 8, Subchapters 8, 9, and 10.

14. ARM 17.8.765 Transfer of Permit. This rule states that an air quality permit may be transferred from one person to another if written notice of intent to transfer, including the names of the transferor and the transferee, is sent to the Department. The Department received the appropriate notice from the transferor and transferee.

F. ARM 17.8, Subchapter 8 – Prevention of Significant Deterioration of Air Quality, including, but not limited to:

1. ARM 17.8.801 Definitions. This rule is a list of applicable definitions used in this subchapter.

2. ARM 17.8.818 Review of Major Stationary Sources and Major Modifications--Source Applicability and Exemptions. The requirements contained in ARM 17.8.819 through ARM 17.8.827 shall apply to any major stationary source and any major modification, with respect to each pollutant subject to regulation under the FCAA that it would emit, except as this subchapter would otherwise allow.

This facility is not a major stationary source because this facility is not a listed source and the facility's PTE is below 250 TPY of any pollutant (excluding fugitive emissions).

G. ARM 17.8, Subchapter 12 – Operating Permit Program Applicability, including, but not limited to:

1. ARM 17.8.1201 Definitions. (23) Major Source under Section 7412 of the FCAA is defined as any source having:

a. PTE > 100 TPY of any pollutant;

b. PTE > 10 TPY of any one HAP, PTE > 25 TPY of a combination of all HAPs, or lesser quantity as the Department may establish by rule; or

c. PTE > 70 TPY of PM_{10} in a serious PM_{10} nonattainment area.

2. ARM 17.8.1204 Air Quality Operating Permit Program. (1) Title V of the FCAA amendments of 1990 requires that all sources, as defined in ARM 17.8.1204(1), obtain a Title V Operating Permit. In reviewing and issuing MAQP #4449-03 for BHJV, the following conclusions were made:

a. The facility's PTE is greater than 100 TPY for NO_x and CO.

b. The facility's PTE is less than 10 TPY for any one HAP and less than 25 TPY for all HAPs.

c. This source is not located in a serious PM_{10} nonattainment area.

d. This facility is subject to a current NSPS (40 CFR 60, Subpart A and Subpart IIII).

e. This facility is subject to area source provisions of a current NESHAP (40 CFR 63, Subpart A and Subpart ZZZZ).

f. This source is not a Title IV affected source, or a solid waste combustion unit.

g. This source is not an EPA designated Title V source.

Based on these facts, the Department determined that BHJV is subject to the Title V operating permit program. BHJV will be required to submit an application for a Title V Operating Permit within 12 months of startup of the new equipment included in this permitting action.

III. BACT Determination

A BACT determination is required for each new or modified source. BHJV shall install on the new or modified source the maximum air pollution control capability which is technically practicable and economically feasible, except that BACT shall be utilized.

A BACT analysis was submitted by BHJV in permit application #4449-03, addressing some available methods of controlling emissions from the new sources that would be used at the mine. The Department reviewed these methods, as well as previous BACT determinations. The following control options have been reviewed by the Department in order to make the following BACT determination.

Diesel Engine BACT Analysis

The control options required for the diesel engines are consistent with other recently permitted similar sources and are capable of achieving the appropriate emission standards. NO_x is the primary pollutant emitted from this type of source. The following options were examined during the NO_x BACT analysis for the diesel engines:

1. Combustion modifications, such as injection timing retard, preignition chamber combustion, air-to-fuel ratio adjustment. This type of control technology helps reduce NO_x formation in the combustion zone.

2. Selective Catalytic Reduction (SCR), which is a post-combustion gas treatment technique that uses a catalyst to reduce nitrogen oxide (NO) and NO_2 to molecular nitrogen, water and oxygen (O_2). Ammonia (NH_3) or urea are commonly used as reducing agents.

3. Non-selective Catalytic Reduction (NSCR) uses a three-way catalyst to promote the decomposition of NO_x to nitrogen and water. Exhaust carbon monoxide and hydrocarbons are simultaneously oxidized to carbon dioxide (CO_2) and water in this process. NSCR is applicable only to engines with exhaust O_2 concentrations below approximately 1% (such as rich-burn natural gas-fired engines); and

4. Proper design and operation can reduce NO_x by controlling the combustion temperature, residence time, and available O_2. Normal combustion practices involve maximizing the heating efficiency of the fuel in an effort to minimize fuel usage. Increasing the efficiency of fuel combustion also minimizes NO_x formation.

Technical Feasibility

NSCR is only applicable to rich-burn engines and diesel-fueled engines cannot be operated as rich-burn. Consequently, NSCR is technically infeasible for the diesel engines. An SCR unit requires that the combustion unit operate on a continuous basis for optimal NO_x control. The generator engines are permitted to operate continuously because they will provide electricity to mining operations. The air compressor engine is also permitted to operate continuously; however, actual practice will most likely result in intermittent operations on an as-needed basis. SCR is considered technically infeasible for engines that will only be operated intermittently on an as-needed basis. SCR is technically feasible for the generator engines because they could experience continuous operation.

Environmental Feasibility

The primary environmental concern from an SCR system is the on-site storage and usage of the ammonia or urea reagent. In addition, the reagent is injected into the exhaust stream in excess of stoichiometric amounts to achieve maximum control of NO_x; therefore, some of the reagent does not have the opportunity to react and is then exhausted to the atmosphere. Although this type of system is in operation at many facilities, it is an additional environmental liability.

Economic Feasibility

Due to the relatively short 5-year duration of the mining project, the cost of implementing and maintaining an SCR system represents an adverse economic impact that is disproportionately high relative to control costs required of similar facilities. Estimates provided by BHJV are greater than $4,400 per ton of NO_x controlled for each engine. It is therefore eliminated from consideration as BACT for this application.

BHJV proposes proper engine design and combustion with no add-on controls using good operating practices as BACT for NO_x. The proposed new engines are certified by the manufacturer to achieve USEPA Tier 2 and Tier 3 federal emissions standards. In 1994, USEPA adopted the first set of emission standards (Tier 1) for all new nonroad diesel engines greater than 50-bhp. In 1998, USEPA adopted more stringent emission standards (Tier 2 and Tier 3) for new nonroad diesel engines. Tier 2 emission standards began to be phased in starting in 2001 for all engine sizes and more stringent Tier 3 standards for engines between 50 and 750-bhp in began phase-in in 2006. The Tier 1-3 standards are met through advanced engine design, with no or only limited use of exhaust gas aftertreatment. The Department has determined that NO_x BACT will be the proper engine design and combustion with no add-on controls using good operating practices for the proposed new diesel engines. The proposed NO_x BACT conforms with previous BACT determinations made by the Department for diesel-fired nonroad engines.

PM emissions from diesel engines are assumed to all be in the $PM_{2.5}$ range; therefore, emission rates for PM and PM_{10} are assumed to be equal to the $PM_{2.5}$ emission rates. The most commonly used PM control methods in diesel engines are good combustion practices and particulate filters. BHJV estimated an $80,000 per ton of PM removed for the installation of particulate filters.

CO emissions from diesel engines are a result of incomplete combustion of the fuel. There is often a trade-off between low NO_x emissions and elevated CO emissions. Therefore, many of the combustion modifications designed to reduce NO_x emissions result in an increase in CO emissions. Conversely, an engine designed to maximize the combustion efficiency to minimize the CO emissions would undermine efforts to reduce NO_x emissions; therefore, this approach is considered technically infeasible. The CO emissions control methods analyzed for BACT are catalytic oxidation and efficient combustion. Catalytic oxidation is the most stringent control technology and consists of a passive reactor comprised of a honeycomb grid of metal panels coated with a platinum catalyst that is placed in the exhaust stream. The oxidation catalyst is considered technically feasible to control the CO emissions from the diesel engines. BHJV estimated that the use of oxidation catalysts in the new engines would cost more than $28,000 per ton of CO removed.

Similar to CO, volatile organic compounds (VOC) occur as a result of incomplete combustion of the fuel. They are also controlled through catalytic oxidation and efficient combustion practices. The catalyst will control VOC emissions at varying efficiencies depending upon the speciation of the hydrocarbons found in the fuel. Unburned straight chain hydrocarbons will pass through the catalyst relatively uncontrolled, while others may be controlled at 80-90% levels.

The Department determined that additional controls for PM, PM_{10}, $PM_{2.5}$, VOC, and CO are technically or economically infeasible based on the limited amounts that could be potentially emitted and the relatively short duration of the project. The USEPA Tier 2 and 3 certifications include emission standards for PM, VOC, and CO. Therefore, the Department determined that proper operation and maintenance with no additional controls for PM, PM_{10}, $PM_{2.5}$, VOC, and CO would constitute BACT for the proposed engines.

SO_2 emissions are not addressed by the federally mandated USEPA nonroad engine emission standards. SO_2 emissions from diesel-fired engines results from oxidation of sulfur contained in the fuel. BHJV proposes to control SO_2 emissions through the use of diesel fuel compliant with 40 CFR 80.510(b) which federally mandates that all nonroad diesel fuel have a sulfur content no greater than 0.0015% (15 parts per million by weight (ppmv)) starting in June 1, 2010. This is the most stringent level of control for SO_2 and because BHJV proposed this most stringent level, no further control technologies were analyzed. BACT for SO_2 for the diesel engines will be to use diesel fuel having a sulfur content no greater than 0.0015% (15 ppmv).

Fugitive Emissions BACT Analysis

The fugitive sources of PM emissions associated with this permitting action include increases in aggregate throughput, increases in haul road traffic, and the addition of aggregate crushing and screening equipment. Two types of emissions controls are readily available and used for dust suppression of these fugitive emissions. These two control methods are water and chemical dust suppressant. Chemical dust suppressant could be used to control the fugitive emissions. Water is more readily available, is less expensive, is equally effective as chemical dust suppressant, and is more environmentally friendly than chemical dust suppressant. Therefore, water has been identified as BACT for particulate emissions from aggregate handling, crushing, and screening. In addition, water suppression has been required of recently permitted similar sources. BHJV may use chemical dust suppressant to assist in controlling particulate emissions.

BHJV must also take reasonable precautions to limit the fugitive emissions of airborne particulate matter from haul roads, access roads, parking areas, and the general area of operation. BHJV is required to have water spray bars and water available on site (at all times) and to apply the water, as necessary, to maintain compliance with the opacity and reasonable precaution limitations. BHJV may also use chemical dust suppression in order to maintain compliance with emission limitations in Section II.A of MAQP #4449-03. The Department determined that using water and/or chemical dust suppressant to maintain compliance with the opacity requirements and reasonable precaution limitations constitutes BACT for the fugitive emission sources.

IV. Emission Inventory

Non-Fugitive Sources	**TPY**						
Emission Source	**PM**	**PM_{10}**	**$PM_{2.5}$***	**NO_x**	**CO**	**VOC**	**SO_2**
Cement Silo loading	0.14	0.14	0.14				
Shotcrete Plant Cement Feed Auger to Mix Tank	1.09	0.27	0.05				
CRF Plant Cement Feed Auger to Mix Hopper	10.42	2.57	0.51				
Diesel Generator(s) - Up to 1,475-bhp (EPA Tier 2)	2.14	2.14	2.14	64.09	37.03	16.24	13.24
Diesel Engine - Compressor 540-bhp (EPA Tier 3)	0.78	0.78	0.78	17.91	13.56	5.95	4.85
Diesel Engine - Welder 26-bhp (EPA Tier 2)	0.08	0.08	0.08	1.31	0.93	0.10	0.23
Diesel Generator - 1,502-hp (EPA Tier 2)	2.18	2.18	2.18	84.67	37.71	1.49	0.08
Diesel Engine - Crusher 350-hp (EPA Tier 3)	0.51	0.51	0.51	10.14	8.79	3.85	3.14
Diesel Engine - Screen 100-hp (EPA Tier 3)	0.29	0.29	0.29	3.39	3.59	1.11	0.90
Total Emissions	**17.62**	**8.94**	**6.68**	**185.78**	**101.60**	**28.74**	**22.45**

NOTES:

PM Particulate matter

PM_{10} PM with an aerodynamic diameter of 10 microns or less

$PM_{2.5}$ PM with an aerodynamic diameter of 2.5 microns or less

* $PM_{2.5}$ estimations are for filterable fractions only

NO_x Oxides of nitrogen

CO Carbon monoxide

VOC Volatile organic compounds

SO_2 Sulfur dioxide

Fugitive Sources	**TPY**						
Emission Source	**PM**	**PM_{10}**	**$PM_{2.5}$***	**NO_x**	**CO**	**VOC**	**SO_2**
Ore Unloading	0.27	0.13	0.02				
Development Rock Unloading	0.16	0.08	0.01				
Ore Haul Truck Loading	0.38	0.18	0.03				
Ore Haul Truck Travel	30.13	8.61	0.86				
Unloading Sand to Storage Area	0.03	0.01	0.00				
Shotcrete Plant Sand Transfer to Mixing Pit w/FEL	0.03	0.01	0.00				
CRF Plant Aggregate Hopper loading w/ FEL	1.89	0.90	0.18				
FEL travel	34.68	9.66	0.97				
Shotcrete truck transport to underground	0.57	0.16	0.02				
CRF Plant truck transport to underground	9.36	2.61	0.26				
2x15000 gallon diesel tank						0.01	
6,000 gallon diesel tank						0.00	
Development Rock Stockpile Wind Erosion	5.59	1.68	0.25				
150 TPH Crusher	1.77	0.79	0.07				
500 TPH Screen	27.38	9.53	0.11				
Crushing and Screening material transfers and piles	13.25	5.36	0.41				
Total Emissions	**125.48**	**39.70**	**3.19**	**0.00**	**0.00**	**0.01**	**0.00**

NOTES:

* $PM_{2.5}$ estimations are for filterable fractions only

Underground Mine Sources	TPY						
Emission Source	**PM**	**PM_{10}**	**$PM_{2.5}$***	**NO_x**	**CO**	**VOC**	**SO_2**
Wet Drilling	0.03	0.03	0.03				
Blasting	0.09	0.05	0.00	0.23	12.32		
Underground Ore Loading	0.06	0.03	0.00				
Underground Development Rock Loading	0.04	0.02	0.00				
Total Emissions	**0.22**	**0.13**	**0.04**	**0.23**	**12.32**	**0.00**	**0.00**

NOTES:
* $PM_{2.5}$ estimations are for filterable fractions only

Facility-Wide Emissions	TPY						
	PM	**PM_{10}**	**$PM_{2.5}$***	**NO_x**	**CO**	**VOC**	**SO_2**
Total Emissions	**143.33**	**48.77**	**9.90**	**186.01**	**113.92**	**28.75**	**22.45**

NOTES:
* $PM_{2.5}$ estimations are for filterable fractions only

CALCULATIONS

Non-fugitive Sources

Cement Silo
Flow Capacity = 375 cubic feet per minute (cfm) (Vendor information)
Maximum Hours of Operation = 8,760 hrs/yr

Total PM Emissions:
Emission Factor = 0.01 gr/dscf (Vendor information)
Calculation:
(375 cfm) * (8760 hrs/yr) * (0.01 gr/dscf) * (lb/7000 gr) * (ton/2000 lb) * (60 min/hr) = 0.14 TPY

Total PM_{10} Emissions:
Emission Factor = 0.01 gr/dscf (Vendor information)
Calculation:
(375 cfm) * (8760 hrs/yr) * (0.01 gr/dscf) * (lb/7000 gr) * (ton/2000 lb) * (60 min/hr) = 0.14 TPY

Total $PM_{2.5}$ Emissions:
Emission Factor = 0.01 gr/dscf (Vendor information, assume $PM_{2.5}$ = PM_{10})
Calculation:
(375 cfm) * (8760 hrs/yr) * (0.01 gr/dscf) * (lb/7000 gr) * (ton/2000 lb) * (60 min/hr) = 0.14 TPY

Shotcrete Plant Cement Feed Auger to Mix Tank
Maximum Process Rate = 0.92 ton/hr (Company Information based on max daily short-term throughput)
Maximum Hours of Operation = 8,760 hrs/yr
Number of Transfers = 1 transfer (Company Information)

Total PM Emissions:
Emission Factor = 0.544 lb/ton (AP 42, Table 11.12-2, 6/06)
Control Efficiency = 50% (Water Spray)
Calculation: (0.92 ton/hr) * (8760 hrs/yr) * (0.544 lb/ton) * (ton/2000 lb) * (1 transfer) * (1 - 50/100) = 1.09 TPY

Total PM_{10} Emissions:
Emission Factor = 0.134 lb/ton (AP 42, Table 11.12-2, 6/06)
Control Efficiency = 50% (Water Spray)
Calculation: (0.92 ton/hr) * (8760 hrs/yr) * (0.134 lb/ton) * (ton/2000 lb) * (1 transfer) * (1 - 50/100) = 0.27 TPY

Total $PM_{2.5}$ Emissions:
Emission Factor = 0.0268 lb/ton (assume $PM_{2.5}$ = 20% * PM_{10}, AP 42, Table 11.12-2, 6/06)
Control Efficiency = 50% (Water Spray)
Calculation: (0.92 ton/hr) * (8760 hrs/yr) * (0.0268 lb/ton) * (ton/2000 lb) * (1 transfer) * (1 - 50/100) = 0.05 TPY

CRF Plant Cement Feed Auger to Mix Hopper
Maximum Process Rate = 4.38 ton/hr (Company Information based on max daily short-term throughput)
Maximum Hours of Operation = 8,760 hrs/yr
Number of Transfers = 1 transfer (Company Information)

Total PM Emissions:
Emission Factor = 0.544 lb/ton (0.544 uncontrolled, AP 42, Table 11.12-2, 6/06)
Calculation: (4.38 ton/hr) * (8760 hrs/yr) * (0.544 lb/ton) * (ton/2000 lb) * (1 transfer) = 10.42 TPY

Total PM_{10} Emissions:
Emission Factor = 0.134 lb/ton (0.134 uncontrolled, AP 42, Table 11.12-2, 6/06)
Control Efficiency = 0% (Uncontrolled)
Calculation: (4.38 ton/hr) * (8760 hrs/yr) * (0.134 lb/ton) * (ton/2000 lb) * (1 transfer) = 2.57 TPY

Total $PM_{2.5}$ Emissions:
Emission Factor = 0.0268 lb/ton (assume $PM_{2.5}$ = 20% * PM_{10}, AP 42, Table 11.12-2, 6/06)
Calculation: (4.38 ton/hr) * (8760 hrs/yr) * (0.0268 lb/ton) * (ton/2000 lb) * (1 transfer) = 0.51 TPY

Diesel Generator(s) – Up to 1,475-bhp combined, minimum 300-bhp each, USEPA Tier 2 compliant
Operational Capacity of Engine(s) = 1,475-bhp
Hours of Operation = 8,760.00 hours

$PM/PM_{10}/PM_{2.5}$ Emissions:
Emission Factor = 3.31E-04 lbs/hp-hr (USEPA Tier 2 emission standards, assume includes CPM and all PM < 1 um, AP-42 Table 3.3-2, footnote b)
Calculation: (8,760 hours) * (1,475-bhp) * (3.31E-04 lbs/hp-hr) * (ton/2000 lb) = 2.14 TPY

NO_x Emissions:
Emission Factor = 9.92E-03 lbs/hp-hr (USEPA Tier 2 emission standards)
Calculation: (8,760 hours) * (1,475-bhp) * (9.92E-03 lbs/hp-hr) * (ton/2000 lb) = 64.09 TPY

CO Emissions:
Emission Factor = 5.73E-03 lbs/hp-hr (USEPA Tier 2 emission standards)
Calculation: (8,760 hours) * (1,475-bhp) * (5.73E-03 lbs/hp-hr) * (ton/2000 lb) = 37.03 TPY

VOC Emissions:
Emission Factor = 2.51E-03 lbs/hp-hr (AP-42, Sec. 3.3, Table 3.3-1, TOC, Exhaust & Crankcase, 10/96)
Calculation: (8,760 hours) * (1000 bhp) * (2.51E-03 lbs/hp-hr) * (ton/2000 lb) = 16.24 TPY

SO_2 Emissions:
Emission Factor = 0.00205 lbs/hp-hr (AP-42, Sec. 3.3, Table 3.3-1, 10/96)
Calculation: (8,760 hours) * (1,475-bhp) * (0.00205 lbs/hp-hr) * (ton/2000 lb) = 13.24 TPY

Diesel Engine – 540-bhp air compressor USEPA Tier 3 compliant
Operational Capacity of Engine = 540 hp
Hours of Operation = 8,760 hours

$PM/PM_{10}/PM_{2.5}$ Emissions:
Emission Factor = 3.30E-04 lbs/hp-hr (USEPA Tier 3 emissions standards, assume includes CPM and all PM < 1 um, AP-42 Table 3.3-2, footnote b)
Calculation: (8,760 hours) * (540 hp) * (3.30E-04 lbs/hp-hr) * (ton/2000 lb) = 0.78 TPY

NO_x Emissions:
Emission Factor = 4.09 lbs/ hr (modeled based on manufacturer worst-case rate, exceeds USEPA Tier 3 emissions standards)
Calculation: (8,760 hours) * (4.09 lbs/hr) * (ton/2000 lb) = 17.91 TPY

CO Emissions:
Emission Factor = 5.73E-03 lbs/hp-hr (USEPA Tier 3 emissions standards)
Calculation: (8,760 hours) * (540 hp) * (5.73E-03 lbs/hp-hr) * (ton/2000 lb) = 13.56 TPY

VOC Emissions:
Emission Factor = 2.51E-03 lbs/hp-hr (AP-42, Sec. 3.3, Table 3.3-1, TOC, Exhaust & Crankcase, 10/96))
Calculation: (8,760 hours) * (540 hp) * (2.51E-03 lbs/hp-hr) * (ton/2000 lb) = 5.95 TPY

SO_2 Emissions:
Emission Factor = 0.00205 lbs/hp-hr (AP-42, Sec. 3.3, Table 3.3-1, 10/96)
Calculation: (8,760 hours) * (540 hp) * (0.00205 lbs/hp-hr) * (ton/2000 lb) = 4.85TPY

Diesel Engine – 26-bhp welder Tier 2 compliant
Operational Capacity of Engine = 26 hp
Hours of Operation = 8,760 hours

$PM/PM_{10}/PM_{2.5}$ Emissions:
Emission Factor = 6.61E-04 lbs/hp-hr (USEPA Tier 2 emissions standards, assume includes CPM and all PM < 1 um, AP-42 Table 3.3-2, footnote b)
Calculation: (8,760 hours) * (26 hp) * (6.61E-04 lbs/hp-hr) * (ton/2000 lb) = 0.08 TPY

NO_x Emissions:
Emission Factor = 1.15E-02 lbs/hp-hr (USEPA Tier 2 emissions standards, speciated according to Santa Barbara County Air Pollution Control District (SBCAPCD))
Calculation: (8,760 hours) * (26 hp) * (1.15E-02 lbs/hp-hr) * (ton/2000 lb) = 1.31 TPY

CO Emissions:
Emission Factor = 8.16E-03 lbs/hp-hr (USEPA Tier 2 emissions standards)
Calculation: (8,760 hours) * (26 hp) * (8.16E-03 lbs/hp-hr) * (ton/2000 lb) = 0.93 TPY

VOC Emissions:
Emission Factor = 8.82E-04 lbs/hp-hr (USEPA Tier 2 emissions standards, speciated according to SBCAPCD)
Calculation: (8,760 hours) * (26 hp) * (8.82E-04 lbs/hp-hr) * (ton/2000 lb) = 0.10 TPY

SO_2 Emissions:
Emission Factor = 0.00205 lbs/hp-hr (AP-42, Sec. 3.3, Table 3.3-1, 10/96)
Calculation: (8,760 hours) * (26 hp) * (0.00205 lbs/hp-hr) * (ton/2000 lb) = 0.23 TPY

Diesel Engine – 1,502-bhp generator Tier 2 compliant
Operational Capacity of Engine = 1,502 hp
Hours of Operation = 8,760 hours

$PM/PM_{10}/PM_{2.5}$ Emissions:
Emission Factor = 0.00033 lbs/hp-hr (USEPA Tier 2 emission standards, assume includes CPM and all PM < 1 um, AP-42 Table 3.3-2, footnote b)
Calculation: (8,760 hours) * (1,502 hp) * (0.00033 lbs/hp-hr) * (ton/2000 lb) = 2.18 ton/yr

NO_x Emissions:
Emission Factor = 19.33 lb/hr (based on modeling at MFG worse-case, Tier 2 is less than this)
Calculation: (8,760 hours) * (1,502 hp) * (19.33 lb/hr) * (ton/2000 lb) = 84.67 ton/yr

CO Emissions:
Emission Factor = 0.0057 lbs/hp-hr (USEPA Tier 2 emission standards)
Calculation: (8,760 hours) * (1,502 hp) * (0.0057 lbs/hp-hr) * (ton/2000 lb) = 37.71 ton/yr

VOC Emissions:
Emission Factor = 0.34 lb/hr (MFG worse-case, 10% load, assume HC = VOC)
Calculation: (8,760 hours) * (0.34 lb/hr) * (ton/2000 lb) = 1.49 ton/yr

SO_2 Emissions:
Emission Factor = 0.000012135 lbs/hp-hr (AP-42, Sec. 3.4, Table 3.4-1, 10/96, S=15ppmw ultra-low sulfur)
Calculation: (8,760 hours) * (1,502 hp) * (0.000012135 lbs/hp-hr) * (ton/2000 lb) = 0.080 ton/yr

Diesel Engine – 350-bhp crusher Tier 3 compliant
Operational Capacity of Engine = 350 hp
Hours of Operation = 8,760 hours

$PM/PM_{10}/PM_{2.5}$ Emissions:
Emission Factor = 0.000330695121144646 lbs/hp-hr (USEPA Tier 3 emission standards, assume includes CPM and all PM < 1 um, AP-42 Table 3.3-2, footnote b)
Calculation: (8,760 hours) * (350 hp) * (0.000330695121144646 lbs/hp-hr) * (ton/2000 lb) = 0.51 ton/yr

NO_x Emissions:
Emission Factor = 0.00661390242289292 lbs/hp-hr (USEPA Tier 3 emission standards)
Calculation: (8,760 hours) * (350 hp) * (0.00661390242289292 lbs/hp-hr) * (ton/2000 lb) = 10.14 ton/yr

CO Emissions:
Emission Factor = 0.0057320487665072 lbs/hp-hr (USEPA Tier 3 emission standards)
Calculation: (8,760 hours) * (350 hp) * (0.0057320487665072 lbs/hp-hr) * (ton/2000 lb) = 8.79 ton/yr

VOC Emissions:
Emission Factor = 0.0025141 lbs/hp-hr (AP-42, Sec. 3.3, Table 3.3-1, TOC, Exhaust & Crankcase, 10/96)
Calculation: (8,760 hours) * (350 bhp) * (0.0025141 lbs/hp-hr) * (ton/2000 lb) = 3.85 ton/yr
Assume TOC = VOC

SO_2 Emissions:
Emission Factor = 0.00205 lbs/hp-hr (AP-42, Sec. 3.3, Table 3.3-1, 10/96)
Calculation: (8,760 hours) * (350 hp) * (0.00205 lbs/hp-hr) * (ton/2000 lb) = 3.143 ton/yr

Diesel Engine – 100-bhp screen Tier 3 compliant
Operational Capacity of Engine = 100 hp
Hours of Operation = 8,760 hours

$PM/PM_{10}/PM_{2.5}$ Emissions:
Emission Factor = 0.000661390242289292 lbs/hp-hr (USEPA Tier 3 emission standards, assume includes CPM and all PM < 1 um, AP-42 Table 3.3-2, footnote b)
Calculation: (8,760 hours) * (100 hp) * (0.000661390242289292 lbs/hp-hr) * (ton/2000 lb) = 0.29 ton/yr

NO_x Emissions:
Emission Factor = 0.00771621949337508 lbs/hp-hr (USEPA Tier 3 emission standards)
Calculation: (8,760 hours) * (100 hp) * (0.00771621949337508 lbs/hp-hr) * (ton/2000 lb) = 3.39 ton/yr

CO Emissions:
Emission Factor = 0.00815714632156794 lbs/hp-hr (USEPA Tier 3 emission standards)
Calculation: (8,760 hours) * (100 hp) * (0.00815714632156794 lbs/hp-hr) * (ton/2000 lb) = 3.59 ton/yr

VOC Emissions:
Emission Factor = 0.0025141 lbs/hp-hr (AP-42, Sec. 3.3, Table 3.3-1, TOC, Exhaust & Crankcase, 10/96)
Calculation: (8,760 hours) * (100.4 bhp) * (0.0025141 lbs/hp-hr) * (ton/2000 lb) = 1.11 ton/yr
Assume TOC = VOC

SO_2 Emissions:
Emission Factor = 0.00205 lbs/hp-hr (AP-42, Sec. 3.3, Table 3.3-1, 10/96)
Calculation: (8,760 hours) * (100 hp) * (0.00205 lbs/hp-hr) * (ton/2000 lb) = 0.901 ton/yr

Fugitive Sources

Ore Unloading
Maximum Process Rate = 52 ton/hr (Maximum plant process rate)
Maximum Hours of Operation = 8,760 hrs/yr
Number of Piles = 1 pile

PM Emissions:
Predictive equation for emission factor provided per AP 42, Sec. 13.2.4.3, 11/06.
Emission Factor = k (0.0032) * (U/5) ^1.3 * (M / 2) ^-1.4 = 0.00119 lb/ton
Where: k = particle size multiplier = 0.74 (Value for PM < 30 microns per AP 42, Sec. 13.2.4.3, 11/06)
U = mean wind speed = 6.2 mph (Provided by company for average Butte wind speed)
M = material moisture content = 4% (Provided by company)
Calculation: (52 ton/hr) * (8760 hrs/yr) * (0.00119 lb/ton) * (ton/2000 lb) * (1 piles) = 0.27 TPY

PM_{10} Emissions:
Predictive equation for emission factor provided per AP 42, Sec. 13.2.4.3, 11/06.
Emission Factor = k (0.0032) * (U/5) ^1.3 * (M / 2) ^-1.4 = 0.00056 lb/ton
Where: k = particle size multiplier = 0.35 (Value for PM < 10 microns per AP 42, Sec. 13.2.4.3, 11/06)
U = mean wind speed = 6.2 mph (Provided by company for average Butte wind speed)
M = material moisture content = 4% (Provided by company)
Calculation: (52 ton/hr) * (8760 hrs/yr) * (0.00056 lb/ton) * (ton/2000 lb) * (1 piles) = 0.13 TPY

$PM_{2.5}$ Emissions:
Predictive equation for emission factor provided per AP 42, Sec. 13.2.4.3, 11/06.
Emission Factor = k (0.0032) * (U/5) ^1.3 * (M / 2) ^-1.4 = 0.00009 lb/ton
Where: k = particle size multiplier = 0.053 (Value for PM < 2.5 microns per AP 42, Sec. 13.2.4.3, 11/06)
U = mean wind speed = 6.2 mph (Provided by company for average Butte wind speed)
M = material moisture content = 4% (Provided by company)
Calculation: (52 ton/hr) * (8760 hrs/yr) * (0.00009 lb/ton) * (ton/2000 lb) * (1 piles) = 0.02 TPY

Development Rock Unloading
Maximum Process Rate = 52 ton/hr (Maximum plant process rate)
Maximum Hours of Operation = 8,760 hrs/yr
Number of Piles = 1 pile

PM Emissions:
Predictive equation for emission factor provided per AP 42, Sec. 13.2.4.3, 11/06.
Emission Factor = k (0.0032) * (U/5) ^1.3 * (M / 2) ^-1.4 = 0.00119 lb/ton
Where: k = particle size multiplier = 0.74 (Value for PM < 30 microns per AP 42, Sec. 13.2.4.3, 11/06)
U = mean wind speed = 6.2 mph (Provided by company for average Butte wind speed)
M = material moisture content = 4% (Provided by company)
Calculation: (52 ton/hr) * (8760 hrs/yr) * (0.00119 lb/ton) * (ton/2000 lb) * (1 piles) = 0.16 TPY

PM_{10} Emissions:
Predictive equation for emission factor provided per AP 42, Sec. 13.2.4.3, 11/06.
Emission Factor = k (0.0032) * (U/5)^1.3 * (M / 2)^-1.4 = 0.00056 lb/ton
Where: k = particle size multiplier = 0.35 (Value for PM < 10 microns per AP 42, Sec. 13.2.4.3, 11/06)
U = mean wind speed = 6.2 mph (Provided by company for average Butte wind speed)
M = material moisture content = 4% (Provided by company)
Calculation: (52 ton/hr) * (8760 hrs/yr) * (0.00056 lb/ton) * (ton/2000 lb) * (1 piles) = 0.08 TPY

$PM_{2.5}$ Emissions:
Predictive equation for emission factor provided per AP 42, Sec. 13.2.4.3, 11/06.
Emission Factor = k (0.0032) * (U/5)^1.3 * (M / 2)^-1.4 = 0.00009 lb/ton
Where: k = particle size multiplier = 0.053 (Value for PM < 2.5 microns per AP 42, Sec. 13.2.4.3, 11/06)
U = mean wind speed = 6.2 mph (Provided by company for average Butte wind speed)
M = material moisture content = 4% (Provided by company)
Calculation: (52 ton/hr) * (8760 hrs/yr) * (0.00009 lb/ton) * (ton/2000 lb) * (1 piles) = 0.01 TPY

Ore Haul Truck Loading
Maximum Process Rate = 73 ton/hr (Maximum plant process rate)
Maximum Hours of Operation = 8,760 hrs/yr
Number of Piles = 1 pile

PM Emissions:
Predictive equation for emission factor provided per AP 42, Sec. 13.2.4.3, 11/06.
Emission Factor = k (0.0032) * (U/5)^1.3 * (M / 2)^-1.4 = 0.00119 lb/ton
Where: k = particle size multiplier = 0.74 (Value for PM < 30 microns per AP 42, Sec. 13.2.4.3, 11/06)
U = mean wind speed = 6.2 mph (Provided by company for average Butte wind speed)
M = material moisture content = 4% (Provided by company)
Calculation: (73 ton/hr) * (8760 hrs/yr) * (0.00119 lb/ton) * (ton/2000 lb) * (1 piles) = 0.38 TPY

PM_{10} Emissions:
Predictive equation for emission factor provided per AP 42, Sec. 13.2.4.3, 11/06.
Emission Factor = k (0.0032) * (U/5)^1.3 * (M / 2)^-1.4 = 0.00056 lb/ton
Where: k = particle size multiplier = 0.35 (Value for PM < 10 microns per AP 42, Sec. 13.2.4.3, 11/06)
U = mean wind speed = 6.2 mph (Provided by company for average Butte wind speed)
M = material moisture content = 4% (Provided by company)
Calculation: (73 ton/hr) * (8760 hrs/yr) * (0.00056 lb/ton) * (ton/2000 lb) * (1 piles) = 0.18 TPY

$PM_{2.5}$ Emissions:
Predictive equation for emission factor provided per AP 42, Sec. 13.2.4.3, 11/06.
Emission Factor = k (0.0032) * (U/5)^1.3 * (M / 2)^-1.4 = 0.00009 lb/ton
Where: k = particle size multiplier = 0.053 (Value for PM < 2.5 microns per AP 42, Sec. 13.2.4.3, 11/06)
U = mean wind speed = 6.2 mph (Provided by company for average Butte wind speed)
M = material moisture content = 4% (Provided by company)
Calculation: (73 ton/hr) * (8760 hrs/yr) * (0.00009 lb/ton) * (ton/2000 lb) * (1 piles) = 0.03 TPY

Ore Haul Truck Travel
Vehicle Miles Traveled (VMT) per Day = 31 VMT/day (Company info)
VMT per hour = (31 VMT/day) * (day/24 hrs) = 1.29 VMT/hr
Hours of Operation = 8,760 hrs/yr

PM Emissions:
Predictive equation for emission factor for unpaved roads at industrial sites provided per AP 42, Ch. 13.2.2, 11/06.
Emission Factor = k * (s / 12)^a * (W / 3)^b = 10.65 lb/VMT
Where: k = constant = 4.9 lbs/VMT (Value for PM_{30}/TSP, AP 42, Table 13.2.2-2, 11/06)
s = surface silt content = 7.5 % (Mean value, sand/gravel processing, material storage area, AP 42, Table 13.2.2-1, 11/06)
W = mean vehicle weight = 35 tons (Company info)
a = constant = 0.7 (Value for PM_{30}/TSP, AP 42, Table 13.2.2-2, 11/06)
b = constant = 0.45 (Value for PM_{30}/TSP, AP 42, Table 13.2.2-2, 11/06)
Control Efficiency = 50% (Water spray or chemical dust suppressant)
Calculation: (8760 hrs/yr) * (1.29 VMT/hr) * (10.65 lb/VMT) * (ton/2000 lb) * (1-50/100) = 30.13 tons/yr (Apply 50% control efficiency)

PM_{10} Emissions:
Predictive equation for emission factor for unpaved roads at industrial sites provided per AP 42, Ch. 13.2.2, 11/06.
Emission Factor = k * (s / 12)^a * (W / 3)^b = 3.04 lb/VMT
Where: k = constant = 1.5 lbs/VMT (Value for PM_{10}, AP 42, Table 13.2.2-2, 11/06)
s = surface silt content = 7.5 % (Mean value, sand/gravel processing, material storage area, AP 42, Table 13.2.2-1, 11/06)
W = mean vehicle weight = 37 tons (Company info)
a = constant = 0.9 (Value for PM_{10}, AP 42, Table 13.2.2-2, 11/06)
b = constant = 0.45 (Value for PM_{10}, AP 42, Table 13.2.2-2, 11/06)
Control Efficiency = 50% (Water spray or chemical dust suppressant)
Calculation: (8760 hrs/yr) * (1.29 VMT/hr) * (3.04 lb/VMT) * (ton/2000 lb) * (1-50/100) = 8.61 tons/yr (Apply 50% control efficiency)

$PM_{2.5}$ Emissions:
Predictive equation for emission factor for unpaved roads at industrial sites provided per AP 42, Ch. 13.2.2, 11/06.
Emission Factor = k * (s / 12)^a * (W / 3)^b = 0.30 lb/VMT
Where: k = constant = 0.15 lbs/VMT (Value for $PM_{2.5}$, AP 42, Table 13.2.2-2, 11/06)
s = surface silt content = 7.5 % (Mean value, sand/gravel processing, material storage area, AP 42, Table 13.2.2-1, 11/06)
W = mean vehicle weight = 37 tons (Company info)
a = constant = 0.9 (Value for $PM_{2.5}$, AP 42, Table 13.2.2-2, 11/06)
b = constant = 0.45 (Value for $PM_{2.5}$, AP 42, Table 13.2.2-2, 11/06)
Control Efficiency = 50% (Water spray or chemical dust suppressant)
Calculation: (8760 hrs/yr) * (1.29 VMT/hr) * (0.30 lb/VMT) * (ton/2000 lb) * (1-50/100) = 0.86 tons/yr (Apply 50% control efficiency)

Unloading Sand to Storage Area
Maximum Process Rate = 3.13 ton/hr (Company Information based on max daily short-term throughput)
Maximum Hours of Operation = 8,760 hrs/yr
Number of Transfers = 1 transfer (Company Information)

Total PM Emissions:
Emission Factor = 0.0021 lb/ton (0.0021 uncontrolled, AP 42, Table 11.12-2, 6/06)
Calculation: (3 ton/hr) * (8760 hrs/yr) * (0.0021 lb/ton) * (ton/2000 lb) * (1 transfer) = 0.03 TPY

Total PM_{10} Emissions:
Emission Factor = 0.00099 lb/ton (0.00099 uncontrolled, AP 42, Table 11.12-2, 6/06)
Control Efficiency = 0% (Uncontrolled)
Calculation: (3 ton/hr) * (8760 hrs/yr) * (0.00099 lb/ton) * (ton/2000 lb) * (1 transfer) = 0.01 TPY

Total $PM_{2.5}$ Emissions:
Emission Factor = 0.000198 lb/ton (assume $PM_{2.5}$ = 20% * PM_{10}, AP 42, Table 11.12-2, 6/06)
Calculation: (3 ton/hr) * (8760 hrs/yr) * (0.000198 lb/ton) * (ton/2000 lb) * (0.02874375 TPY) = 0.00 TPY

Shotcrete Plant Sand Transfer to Mixing Pit with Front End Loader
Maximum Process Rate = 3.13 ton/hr (Company Information based on max daily short-term throughput)
Maximum Hours of Operation = 8,760 hrs/yr
Number of Transfers = 1 transfer (Company Information)

Total PM Emissions:
Emission Factor = 0.0021 lb/ton (0.0021 uncontrolled, AP 42, Table 11.12-2, 6/06)
Calculation: (3 ton/hr) * (8760 hrs/yr) * (0.0021 lb/ton) * (ton/2000 lb) * (1 transfer) = 0.03 TPY

Total PM_{10} Emissions:
Emission Factor = 0.00099 lb/ton (0.00099 uncontrolled, AP 42, Table 11.12-2, 6/06)
Calculation: (3 ton/hr) * (8760 hrs/yr) * (0.00099 lb/ton) * (ton/2000 lb) * (1 transfer) = 0.01 TPY

Total $PM_{2.5}$ Emissions:
Emission Factor = 0.000198 lb/ton (assume $PM_{2.5}$ = 20% * PM_{10}, AP 42, Table 11.12-2, 6/06)
Calculation: (3 ton/hr) * (8760 hrs/yr) * (0.000198 lb/ton) * (ton/2000 lb) * (0.02874375 TPY) = 0.00 TPY

CRF Plant Aggregate Hopper Loading with Front End Loader
Maximum Process Rate = 62.50 ton/hr (Company Information based on max daily short-term throughput)
Maximum Hours of Operation = 8,760 hrs/yr
Number of Transfers = 1 transfer (Company Information)

Total PM Emissions:
Emission Factor = 0.0069 lb/ton (0.0069 uncontrolled, AP 42, Table 11.12-2, 6/06)
Calculation: (63 ton/hr) * (8760 hrs/yr) * (0.0069 lb/ton) * (ton/2000 lb) * (1 transfer) = 1.89 TPY

Total PM_{10} Emissions:
Emission Factor = 0.0033 lb/ton (0.0033 uncontrolled, AP 42, Table 11.12-2, 6/06)
Calculation: (63 ton/hr) * (8760 hrs/yr) * (0.0033 lb/ton) * (ton/2000 lb) * (1 transfer) = 0.90 TPY

Total $PM_{2.5}$ Emissions:
Emission Factor = 0.00066 lb/ton (assume $PM_{2.5}$ = 20% * PM_{10}, AP 42, Table 11.12-2, 6/06)
Calculation: (63 ton/hr) * (8760 hrs/yr) * (0.00066 lb/ton) * (ton/2000 lb) * (1.888875 TPY) = 0.18 TPY

Front End Loader Travel
Vehicle Miles Traveled (VMT) per Day = 39 VMT/day (Company info)
VMT per hour = (39.45 VMT/day) * (day/24 hrs) = 1.64 VMT/hr
Hours of Operation = 8,760 hrs/yr

PM Emissions:
Predictive equation for emission factor for unpaved roads at industrial sites provided per AP 42, Ch. 13.2.2, 11/06.
Emission Factor = k * (s / 12) ^a * (W / 3) ^b = 9.63 lb/VMT
Where: k = constant = 4.9 lbs/VMT (Value for PM30/TSP, AP 42, Table 13.2.2-2, 11/06)
s = surface silt content = 7.5 % (Mean value, sand/gravel processing, material storage area, AP 42, Table 13.2.2-1, 11/06)
W = mean vehicle weight = 28 tons (Company info)
a = constant = 0.7 (Value for PM30/TSP, AP 42, Table 13.2.2-2, 11/06)
b = constant = 0.45 (Value for PM30/TSP, AP 42, Table 13.2.2-2, 11/06)
Control Efficiency = 50% (Water spray or chemical dust suppressant)
Calculation: (8760 hrs/yr) * (1.64 VMT/hr) * (9.63 lb/VMT) * (ton/2000 lb) * (1-50/100) = 34.68 TPY

PM_{10} Emissions:
Predictive equation for emission factor for unpaved roads at industrial sites provided per AP 42, Ch. 13.2.2, 11/06.
Emission Factor = k * (s / 12) ^a * (W / 3) ^b = 2.68 lb/VMT
Where: k = constant = 1.5 lbs/VMT (Value for PM_{10}, AP 42, Table 13.2.2-2, 11/06)
s = surface silt content = 7.5 % (Mean value, sand/gravel processing, material storage area, AP 42, Table 13.2.2-1, 11/06)
W = mean vehicle weight = 28 tons (Company info)
a = constant = 0.9 (Value for PM10, AP 42, Table 13.2.2-2, 11/06)
b = constant = 0.45 (Value for PM10, AP 42, Table 13.2.2-2, 11/06)
Control Efficiency = 50% (Water spray or chemical dust suppressant)
Calculation: (8760 hrs/yr) * (1.64 VMT/hr) * (2.68 lb/VMT) * (ton/2000 lb) * (1-50/100) = 9.66 TPY

$PM_{2.5}$ Emissions:
Predictive equation for emission factor for unpaved roads at industrial sites provided per AP 42, Ch. 13.2.2, 11/06.
Emission Factor = k * (s / 12)^a * (W / 3)^b = 0.27 lb/VMT
Where: k = constant = 0.15 lbs/VMT (Value for $PM_{2.5}$, AP 42, Table 13.2.2-2, 11/06)
s = surface silt content = 7.5 % (Mean value, sand/gravel processing, material storage area, AP 42, Table 13.2.2-1, 11/06)
W = mean vehicle weight = 28 tons (Company info)
a = constant = 0.9 (Value for PM2.5, AP 42, Table 13.2.2-2, 11/06)
b = constant = 0.45 (Value for PM2.5, AP 42, Table 13.2.2-2, 11/06)
Control Efficiency = 50% (Water spray or chemical dust suppressant)
Calculation: (8760 hrs/yr) * (1.64 VMT/hr) * (0.27 lb/VMT) * (ton/2000 lb) * (1-50/100) = 0.97 TPY

Shotcrete Truck Transport to Underground
Vehicle Miles Traveled (VMT) per Day = 1 VMT/day (Company info)
VMT per hour = (0.582 VMT/day) * (day/24 hrs) = 0.02 VMT/hr
Hours of Operation = 8,760 hrs/yr

PM Emissions:
Predictive equation for emission factor for unpaved roads at industrial sites provided per AP 42, Ch. 13.2.2, 11/06.
Emission Factor = k * (s / 12)^a * (W / 3)^b = 10.65 lb/VMT
Where: k = constant = 4.9 lbs/VMT (Value for PM30/TSP, AP 42, Table 13.2.2-2, 11/06)
s = surface silt content = 7.5 % (Mean value, sand/gravel processing, material storage area, AP 42, Table 13.2.2-1, 11/06)
W = mean vehicle weight = 35 tons (Company info)
a = constant = 0.7 (Value for PM30/TSP, AP 42, Table 13.2.2-2, 11/06)
b = constant = 0.45 (Value for PM30/TSP, AP 42, Table 13.2.2-2, 11/06)
Control Efficiency = 50% (Water spray or chemical dust suppressant)
Calculation: (8760 hrs/yr) * (0.02 VMT/hr) * (10.65 lb/VMT) * (ton/2000 lb) * (1-50/100) = 0.57 TPY

PM_{10} Emissions:
Predictive equation for emission factor for unpaved roads at industrial sites provided per AP 42, Ch. 13.2.2, 11/06.
Emission Factor = k * (s / 12)^a * (W / 3)^b = 2.97 lb/VMT
Where: k = constant = 1.5 lbs/VMT (Value for PM_{10}, AP 42, Table 13.2.2-2, 11/06)
s = surface silt content = 7.5 % (Mean value, sand/gravel processing, material storage area, AP 42, Table 13.2.2-1, 11/06)

W = mean vehicle weight = 35 tons (Company info)
a = constant = 0.9 (Value for PM10, AP 42, Table 13.2.2-2, 11/06)
b = constant = 0.45 (Value for PM10, AP 42, Table 13.2.2-2, 11/06)
Control Efficiency = 50% (Water spray or chemical dust suppressant)
Calculation: (8760 hrs/yr) * (0.02 VMT/hr) * (2.97 lb/VMT) * (ton/2000 lb) * (1-50/100) = 0.16 TPY

$PM_{2.5}$ Emissions:
Predictive equation for emission factor for unpaved roads at industrial sites provided per AP 42, Ch. 13.2.2, 11/06.
Emission Factor = k * (s / 12)^a * (W / 3)^b = 0.30 lb/VMT
Where: k = constant = 0.15 lbs/VMT (Value for $PM_{2.5}$, AP 42, Table 13.2.2-2, 11/06)
s = surface silt content = 7.5 % (Mean value, sand/gravel processing, material storage area, AP 42, Table 13.2.2-1, 11/06)
W = mean vehicle weight = 35 tons (Company info)
a = constant = 0.9 (Value for PM2.5, AP 42, Table 13.2.2-2, 11/06)
b = constant = 0.45 (Value for PM2.5, AP 42, Table 13.2.2-2, 11/06)
Control Efficiency = 50% (Water spray or chemical dust suppressant)
Calculation: (8760 hrs/yr) * (0.02 VMT/hr) * (0.30 lb/VMT) * (ton/2000 lb) * (1-50/100) = 0.02 TPY

CRF Plant Truck Transport to Underground
Vehicle Miles Traveled (VMT) per Day = 10 VMT/day (Company info)
VMT per hour = (9.63 VMT/day) * (day/24 hrs) = 0.40 VMT/hr
Hours of Operation = 8,760 hrs/yr

PM Emissions:
Predictive equation for emission factor for unpaved roads at industrial sites provided per AP 42, Ch. 13.2.2, 11/06.
Emission Factor = k * (s / 12)^a * (W / 3)^b = 10.65 lb/VMT
Where: k = constant = 4.9 lbs/VMT (Value for PM_{30}/TSP, AP 42, Table 13.2.2-2, 11/06)
s = surface silt content = 7.5 % (Mean value, sand/gravel processing, material storage area, AP 42, Table 13.2.2-1, 11/06)
W = mean vehicle weight = 35 tons (Company info)
a = constant = 0.7 (Value for PM30/TSP, AP 42, Table 13.2.2-2, 11/06)
b = constant = 0.45 (Value for PM30/TSP, AP 42, Table 13.2.2-2, 11/06)
Control Efficiency = 50% (Water spray or chemical dust suppressant)
Calculation: (8760 hrs/yr) * (0.40 VMT/hr) * (10.65 lb/VMT) * (ton/2000 lb) * (1-50/100) = 9.36 TPY

PM_{10} Emissions:
Predictive equation for emission factor for unpaved roads at industrial sites provided per AP 42, Ch. 13.2.2, 11/06.
Emission Factor = k * (s / 12)^a * (W / 3)^b = 2.97 lb/VMT
Where: k = constant = 1.5 lbs/VMT (Value for PM_{10}, AP 42, Table 13.2.2-2, 11/06)
s = surface silt content = 7.5 % (Mean value, sand/gravel processing, material storage area, AP 42, Table 13.2.2-1, 11/06)
W = mean vehicle weight = 35 tons (Company info)
a = constant = 0.9 (Value for PM_{10}, AP 42, Table 13.2.2-2, 11/06)
b = constant = 0.45 (Value for PM_{10}, AP 42, Table 13.2.2-2, 11/06)
Control Efficiency = 50% (Water spray or chemical dust suppressant)
Calculation: (8760 hrs/yr) * (0.40 VMT/hr) * (2.97 lb/VMT) * (ton/2000 lb) * (1-50/100) = 2.61 TPY

$PM_{2.5}$ Emissions:
Predictive equation for emission factor for unpaved roads at industrial sites provided per AP 42, Ch. 13.2.2, 11/06.
Emission Factor = k * (s / 12)^a * (W / 3)^b = 0.30 lb/VMT
Where: k = constant = 0.15 lbs/VMT (Value for PM2.5, AP 42, Table 13.2.2-2, 11/06)
s = surface silt content = 7.5 % (Mean value, sand/gravel processing, material storage area, AP 42, Table 13.2.2-1, 11/06)
W = mean vehicle weight = 35 tons (Company info)
a = constant = 0.9 (Value for $PM_{2.5}$, AP 42, Table 13.2.2-2, 11/06)
b = constant = 0.45 (Value for $PM_{2.5}$, AP 42, Table 13.2.2-2, 11/06)
Control Efficiency = 50% (Water spray or chemical dust suppressant)
Calculation: (8760 hrs/yr) * (0.40 VMT/hr) * (0.30 lb/VMT) * (ton/2000 lb) * (1-50/100) = 0.26 TPY

Diesel Storage Tanks
TANKS 4.0.9d Report
Distillate fuel oil No. 2

2x15,000 gallon tanks
Total Emissions = 10.28 lbs/yr = 0.0051 TPY each, 0.010 total

6,000 gallon tank
Total Emissions = 3.53 lbs/yr = 0.0018 TPY

Development Rock Stockpile Wind Erosion
Exposed Area = 29 acres (Company Information)
Maximum Hours of Operation = 8,760 hrs/yr
Number of Piles = 1 pile(s) (Company Information)

Total PM Emissions:
Emission Factor = 0.38 tons/acre-yr (TSP, AP 42, Table 11.9-4, 7/98)
Control Efficiency = 50% (Water spray)
Calculation: (29 acres) * (0.38 tons/acre-yr) * (1 - 50/100) = 5.59 TPY

Total PM_{10} Emissions:
Emission Factor = 0.114 tons/acre-yr (Company Information, assume PM_{10} = 30% total PM)
Control Efficiency = 50% (Water spray)
Calculation: (29 acres) * (0.114 tons/acre-yr) * (1 - 50/100) = 1.68 TPY

Total $PM_{2.5}$ Emissions:
Emission Factor = 0.0171 tons/acre-yr (Company Information, assume $PM_{2.5}$ = 15% PM10)
Control Efficiency = 50% (Water spray)
Calculation: (29 acres) * (0.0171 tons/acre-yr) * (1 - 50/100) = 0.25 TPY

Crusher
Maximum Process Rate = 150 ton/hr (Application information)
Maximum Hours of Operation = 8,760 hrs/yr

PM Emissions:
Based on AP-42
Emission Factor = 0.0054 lb/ton (tertiary crushing (uncontrolled), AP 42, Table 11.19.2-2, 8/04)
Control Efficiency = 50%
Calculation: (150 ton/hr) * (8760 hrs/yr) * (0.0054 lb/ton) * (ton/2000 lb) * (1 - 50/100) = 1.77 ton/yr

PM_{10} Emissions:
Based on AP-42
Emission Factor = 0.0024 lb/ton (tertiary crushing (uncontrolled), AP 42, Table 11.19.2-2, 8/04)
Control Efficiency = 50%
Calculation: (150 ton/hr) * (8760 hrs/yr) * (0.0024 lb/ton) * (ton/2000 lb) * (1 - 50/100) = 0.79 ton/yr

$PM_{2.5}$ Emissions:
Emission Factor = 0.0001 lb/ton (tertiary crushing (controlled), AP 42, Table 11.19.2-2, 8/04)
Control Efficiency = 0% (built into emission factor)
Calculation: (150 ton/hr) * (8760 hrs/yr) * (0.0001 lb/ton) * (ton/2000 lb) = 0.07 ton/yr

Screener
Maximum Process Rate = 500 ton/hr (Maximum plant process rate)
Maximum Hours of Operation = 8,760 hrs/yr

Total PM Emissions:
Emission Factor = 0.025 lb/ton (0.025 uncontrolled, 0.0022 controlled, AP 42, Table 11.19.2-2, 8/04)
Control Efficiency = 50%
Calculation: (500 ton/hr) * (8760 hrs/yr) * (0.025 lb/ton) * (ton/2000 lb) * (1 screen(s)) * (1 - 50/100) = 27.38 ton/yr

Total PM_{10} Emissions:
Emission Factor = 0.0087 lb/ton (0.0087 uncontrolled, 0.00074 controlled, AP 42, Table 11.19.2-2, 8/04)
Control Efficiency = 50%
Calculation: (500 ton/hr) * (8760 hrs/yr) * (0.0087 lb/ton) * (ton/2000 lb) * (1 screen(s)) * (1 - 50/100) = 9.53 ton/yr

Total $PM_{2.5}$ Emissions:
Emission Factor = 0.00005 lb/ton (0.000050 controlled, AP 42, Table 11.19.2-2, 8/04)
Control Efficiency = 0% (built into emission factor)
Calculation: (500 ton/hr) * (8760 hrs/yr) * (0.00005 lb/ton) * (ton/2000 lb) * (1 screen(s)) = 0.11 ton/yr

Material Transfers during Crushing
Maximum Process Rate = 150 ton/hr (Maximum crushing process rate estimate)
Maximum Hours of Operation = 8,760 hrs/yr
Number of Transfers = 2 transfer (1input and 1 combined output)

Filterable PM Emissions:
Emission Factor = 0.003 lb/ton (0.0030 uncontrolled, 0.00014 controlled, AP 42, Table 11.19.2-2, 8/04)
Control Efficiency = 50% (Department guidance)
Calculation: (150 ton/hr) * (8760 hrs/yr) * (0.003 lb/ton) * (ton/2000 lb) * (2 transfer) * (1 - 50/100) = 1.97 ton/yr

Filterable PM_{10} Emissions:
Emission Factor = 0.0011 lb/ton (0.00110 uncontrolled, 0.000046 controlled, AP 42, Table 11.19.2-2, 8/04)
Control Efficiency = 50% (Department guidance)
Calculation: (150 ton/hr) * (8760 hrs/yr) * (0.0011 lb/ton) * (ton/2000 lb) * (2 transfer) * (1 - 50/100) = 0.72 ton/yr

Filterable $PM_{2.5}$ Emissions:
Emission Factor = 0.000013 lb/ton (0.000013 controlled, AP 42, Table 11.19.2-2, 8/04)
Control Efficiency = 0% (built into emission factor)
Calculation: (150 ton/hr) * (8760 hrs/yr) * (0.000013 lb/ton) * (ton/2000 lb) * (2 transfer) = 0.02 ton/yr

Material Transfers during Screening
Maximum Process Rate = 500 ton/hr (Maximum screening process rate estimate)
Maximum Hours of Operation = 8,760 hrs/yr
Number of Transfers = 2 transfer (1x100% input + 1x(20%+80%) output = 2x500tph transfers)

Filterable PM Emissions:
Emission Factor = 0.003 lb/ton (0.0030 uncontrolled, 0.00014 controlled, AP 42, Table 11.19.2-2, 8/04)
Control Efficiency = 50% (Department guidance)
Calculation: (500 ton/hr) * (8760 hrs/yr) * (0.003 lb/ton) * (ton/2000 lb) * (2 transfer) * (1 - 50/100) = 6.57 ton/yr

Filterable PM_{10} Emissions:
Emission Factor = 0.0011 lb/ton (0.00110 uncontrolled, 0.000046 controlled, AP 42, Table 11.19.2-2, 8/04)
Control Efficiency = 50% (Department guidance)
Calculation: (500 ton/hr) * (8760 hrs/yr) * (0.0011 lb/ton) * (ton/2000 lb) * (2 transfer) * (1 - 50/100) = 2.41 ton/yr

Filterable $PM_{2.5}$ Emissions:
Emission Factor = 0.000013 lb/ton (0.000013 controlled, AP 42, Table 11.19.2-2, 8/04)
Control Efficiency = 0% (built into emission factor)
Calculation: (500 ton/hr) * (8760 hrs/yr) * (0.000013 lb/ton) * (ton/2000 lb) * (2 transfer) = 0.06 ton/yr

Storage Piles from crushing and screening operations
Maximum Process Rate = 650 ton/hr (Crushing and Screening combined maximum rates)
Maximum Hours of Operation = 8,760 hrs/yr
Number of Piles = 1 piles

Filterable PM Emissions:
Predictive equation for emission factor provided per AP 42, Sec. 13.2.4.3, 11/06.
Emission Factor = k (0.0032) * (U/5)^1.3 * (M / 2)^-1.4 = 0.00331 lb/ton
Where: k = particle size multiplier = 0.74 (Value for PM < 30 microns per AP 42, Sec. 13.2.4.3, 11/06)
U = mean wind speed = 10 mph (Estimate based on values provided in AP 42, Sec. 13.2.4.3, 11/06)
M = material moisture content = 3% (Estimate based on values provided in AP 42, Sec. 13.2.4.3, 11/06)
Control Efficiency = 50% (Water or chemical spray)
Calculation: (650 ton/hr) * (8760 hrs/yr) * (0.00331 lb/ton) * (ton/2000 lb) * (1 piles) * (1 - 50/100) = 4.70 ton/yr

Filterable PM_{10} Emissions:
Predictive equation for emission factor provided per AP 42, Sec. 13.2.4.3, 11/06.
Emission Factor = k (0.0032) * (U/5)^1.3 * (M / 2)^-1.4 = 0.00156 lb/ton

Where: k = particle size multiplier = 0.35 (Value for PM < 10 microns per AP 42, Sec. 13.2.4.3, 11/06)
U = mean wind speed = 10 mph (Estimate based on values provided in AP 42, Sec. 13.2.4.3, 11/06)
M = material moisture content = 3% (Estimate based on values provided in AP 42, Sec. 13.2.4.3, 11/06)
Control Efficiency = 50% (Water or chemical spray)
Calculation: (650 ton/hr) * (8760 hrs/yr) * (0.00156 lb/ton) * (ton/2000 lb) * (1 piles) * (1 - 50/100) = 2.23 ton/yr

Filterable $PM_{2.5}$ Emissions:
Predictive equation for emission factor provided per AP 42, Sec. 13.2.4.3, 11/06.
Emission Factor = k (0.0032) * (U/5)^1.3 * (M / 2)^-1.4 = 0.00024 lb/ton
Where: k = particle size multiplier = 0.053 (Value for PM < 2.5 microns per AP 42, Sec. 13.2.4.3, 11/06)
U = mean wind speed = 10 mph (Estimate based on values provided in AP 42, Sec. 13.2.4.3, 11/06)
M = material moisture content = 3% (Estimate based on values provided in AP 42, Sec. 13.2.4.3, 11/06)
Control Efficiency = 50% (Water or chemical spray)
Calculation: (650 ton/hr) * (8760 hrs/yr) * (0.00024 lb/ton) * (ton/2000 lb) * (1 piles) * (1 - 50/100) = 0.34 ton/yr

Underground Mine Sources

Wet Drilling
Production Rate = 83.33 ton/hr (Company Information based on max daily short-term throughput)
Maximum Hours of Operation = 8,760 hrs/yr

PM Emissions:
Emission Factor = 0.00008 lb/ton (no AP-42 PM data, assume PM=PM_{10})
Calculation: (8760 hrs/yr) * (83.33 ton/hr) * (0.00008 lb/ton) * (ton/2000 lb) = 0.03 TPY

PM_{10} Emissions:
Emission Factor = 0.00008 lb/ton (Wet Drilling, AP-42, Table 11.19.2-2, 8/04)
Calculation: (8760 hrs/yr) * (83.33 ton/hr) * (0.00008 lb/ton) * (ton/2000 lb) = 0.03 TPY

$PM_{2.5}$ Emissions:
Emission Factor = 0.00008 lb/ton (no AP-42 $PM_{2.5}$ data, assume $PM_{2.5}$ = PM_{10})
Calculation: (8760 hrs/yr) * (83.33 ton/hr) * (0.00008 lb/ton) * (ton/2000 lb) = 0.03 TPY

Blasting
Maximum Process Rate = 10 blasts/day (Application information)
Area blasted = 240 sq. ft. (Application information)
Maximum Daily Explosive Usage = 2.5 tons/day (Application information)

PM Emissions:
Emission Factor = 0.000014 * (240 sq. ft.)^1.5 = 0.0521 lb/blast (AP-42, Table 11.9-1, 7/98)
Calculation: (10 blasts/day) * (0.05 lb/blast) * (365 days/year) * (ton/2000 lb) = 0.09 TPY

PM_{10} Emissions:
Emission Factor = 0.000014 * (240 sq. ft.)^1.5 * 0.52 = 0.026 lb/blast (AP-42, Table 11.9-1, 7/98)
Calculation: (10 blasts/day) * (0.03 lb/blast) * (365 days/year) * (ton/2000 lb) = 0.02 TPY

$PM_{2.5}$ Emissions:
Emission Factor = 0.000014 * (240 sq. ft.)^1.5 * 0.03 = 0.0015 lb/blast (AP-42, Table 11.9-1, 7/98)
Calculation: (10 blasts/day) * (0.0016 lb/blast) * (365 days/year) * (ton/2000 lb) = 0.00 TPY

CO Emissions:
Emission Factor = 27 lb/ton (Dyno Nobel North America information)
Calculation: (2.5 tons/day) * (27 lb/ton) * (365 days/year) * (ton/2000 lb) = 12.32 TPY

NO_x Emissions:
Emission Factor = 0.5 lb/ton (Dyno Nobel North America information)
Calculation: (2.5 tons/day) * (0.5 lb/ton) * (365 days/year) * (ton/2000 lb) = 0.23 TPY

Underground Ore Loading
Maximum Process Rate = 52 ton/hr (Maximum plant process rate)
Maximum Hours of Operation = 8,760 hrs/yr
Number of Piles = 1 piles

PM Emissions:
Predictive equation for emission factor provided per AP 42, Sec. 13.2.4.3, 11/06.
Emission Factor = k (0.0032) * (U/5)^1.3 * (M / 2)^-1.4 = 0.00027 lb/ton
Where: k = particle size multiplier = 0.74 (Value for PM < 30 microns per AP 42, Sec. 13.2.4.3, 11/06)
U = mean wind speed = 2 mph (Provided by company for average Butte wind speed)
M = material moisture content = 4% (Provided by company)
Calculation: (52 ton/hr) * (8760 hrs/yr) * (0.00027 lb/ton) * (ton/2000 lb) * (1 piles) = 0.06 TPY

PM_{10} Emissions:
Predictive equation for emission factor provided per AP 42, Sec. 13.2.4.3, 11/06.
Emission Factor = k (0.0032) * (U/5)^1.3 * (M / 2)^-1.4 = 0.00013 lb/ton
Where: k = particle size multiplier = 0.35 (Value for PM < 10 microns per AP 42, Sec. 13.2.4.3, 11/06)
U = mean wind speed = 2 mph (Provided by company for average Butte wind speed)
M = material moisture content = 4% (Provided by company)
Calculation: (52 ton/hr) * (8760 hrs/yr) * (0.00013 lb/ton) * (ton/2000 lb) * (1 piles) = 0.03 TPY

$PM_{2.5}$ Emissions:
Predictive equation for emission factor provided per AP 42, Sec. 13.2.4.3, 11/06.
Emission Factor = k (0.0032) * (U/5)^1.3 * (M / 2)^-1.4 = 0.00002 lb/ton
Where: k = particle size multiplier = 0.053 (Value for PM < 2.5 microns per AP 42, Sec. 13.2.4.3, 11/06)
U = mean wind speed = 2 mph (Provided by company for average Butte wind speed)
M = material moisture content = 4% (Provided by company)
Calculation: (52 ton/hr) * (8760 hrs/yr) * (0.00002 lb/ton) * (ton/2000 lb) * (1 piles) = 0.00 TPY

Underground Development Rock Loading
Maximum Process Rate = 31 ton/hr (Maximum plant process rate)
Maximum Hours of Operation = 8,760 hrs/yr
Number of Piles = 1 piles

PM Emissions:
Predictive equation for emission factor provided per AP 42, Sec. 13.2.4.3, 11/06.
Emission Factor = k (0.0032) * (U/5)^1.3 * (M / 2)^-1.4 = 0.00027 lb/ton
Where: k = particle size multiplier = 0.74 (Value for PM < 30 microns per AP 42, Sec. 13.2.4.3, 11/06)
U = mean wind speed = 2 mph (Provided by company for average Butte wind speed)
M = material moisture content = 4% (Provided by company)
Calculation: (31 ton/hr) * (8760 hrs/yr) * (0.00027 lb/ton) * (ton/2000 lb) * (1 piles) = 0.04 TPY

PM_{10} Emissions:
Predictive equation for emission factor provided per AP 42, Sec. 13.2.4.3, 11/06.
Emission Factor = k (0.0032) * (U/5)^1.3 * (M / 2)^-1.4 = 0.00013 lb/ton
Where: k = particle size multiplier = 0.35 (Value for PM < 10 microns per AP 42, Sec. 13.2.4.3, 11/06)
U = mean wind speed = 2 mph (Provided by company for average Butte wind speed)
M = material moisture content = 4% (Provided by company)
Calculation: (31 ton/hr) * (8760 hrs/yr) * (0.00013 lb/ton) * (ton/2000 lb) * (1 piles) = 0.02 TPY

$PM_{2.5}$ Emissions:
Predictive equation for emission factor provided per AP 42, Sec. 13.2.4.3, 11/06.
Emission Factor = k (0.0032) * (U/5)^1.3 * (M / 2)^-1.4 = 0.00002 lb/ton
Where: k = particle size multiplier = 0.053 (Value for PM < 2.5 microns per AP 42, Sec. 13.2.4.3, 11/06)
U = mean wind speed = 2 mph (Provided by company for average Butte wind speed)
M = material moisture content = 4% (Provided by company)
Calculation: (31 ton/hr) * (8760 hrs/yr) * (0.00002 lb/ton) * (ton/2000 lb) * (1 piles) = 0.00 TPY

V. Existing Air Quality

The existing air quality of the project location is considered in attainment for all regulated air pollutants. Within Silver Bow County is the Butte PM_{10} nonattainment area; however, the project is not located in or within 10 km of the boundaries of this designated area.

VI. Ambient Air Impact Analysis

Due to the levels of potential NO_x emissions from this project, the Department required BHJV to demonstrate compliance with NO_2 ambient air quality standards via air dispersion modeling. The Department determined that the air dispersion modeling demonstration need only account for the NO_x emissions from the new equipment proposed in the current permitting action. This consists of the 540-bhp air compressor diesel engine, the 350-bhp crusher diesel engine, the 100.4-bhp screen diesel engine, and the 1,502-bhp generator diesel engine. This decision was based on the following facts: this mine is an existing permitted source that has complied with the air permitting regulations since its inception; the qualitative ambient air impact analyses performed in the previous permitting actions determined that the existing sources would not violate ambient air quality standards; the location of the mine is designated as unclassifiable/attainment for NO_2; and this mine is a minor source of emissions with respect to PSD permitting and does not require an EIS.

AMEC conducted air dispersion modeling for the facility on behalf of BHJV. The emissions were modeled for comparison to the 1-hour and annual NO_2 National Ambient Air Quality Standards (NAAQS) and Montana Ambient Air Quality Standards (MAAQS). No significant impact level (SIL) analysis was conducted because the closest major source of NO_x emissions is located approximately 9.5 miles away. Table 1 lists the modeled hourly and annual emissions of NO_x.

Table 1. BHJV Modeled Hourly and Annual NO_x Emissions.

Modeled ID	Source	NO_X (pounds per hour)	NO_X (tons per year)	Source of Emissions Data
20	Air Compressor 540-bhp Diesel Engine	4.087	17.903	Manufacture's Data
25	Extec Crusher CAT C9 350-bhp	2.318	10.151	USEPA Tier 3 Standard
27	Sandvik Screener 100.4-bhp	0.778	3.407	USEPA Tier 3 Standard
28	Diesel Generator Caterpillar C32 DITA 1,502-bhp	19.334	84.681	Manufacture's Data
Total		26.517	116.142	

REVIEW OF AERMOD MODEL INPUTS

AERMOD Modeling System: AMEC used the Lakes Environmental AERMOD View (version 7.1.0). The AERMOD modeling system included AERSURFACE (version 08009), AERMET (version 11059), AERMAP (version 11103), and AERMOD (version 11103). The USEPA-developed Building Profile Input Program – Plume Rise Model Enhancement (BPIP-PRIME) version 04274 was used to determine building downwash effects. The AERMOD modeling system was applied in the following manner:

- Stack-tip downwash (regulatory default mode)
- Accounted for elevated terrain (regulatory default mode)
- Calm wind processing routine (regulatory default mode)
- Missing meteorological data processing routines (regulatory default mode)
- No exponential decay (regulatory default mode)
- Ozone Limiting Method (OLM) used for NO_2 conversion with an equilibrium NO_2/NO_x ratio of 0.8 in the atmosphere (non-regulatory default)
- In-stack ratios of 0.2 (non-regulatory default)

An in-stack ratio of 0.2 was selected with MDEQ concurrence since this value is the default ratio for a diesel engine recommended by the San Joaquin Valley Air Pollution Control District (http://www.valleyair.org/busind/pto/tox_resources/Assessment%20of%20Non-Regulatory%20Option%20in%20AERMOD.pdf).

Table 2. BHJV Point Source Parameters.

Modeled ID	Source	UTM NAD83[1] Zone 12		Elevation (m)[4]	Stack Height (m)	Stack Inside Diameter (m)	Stack Gas Exit Temperature (K)[5]	Stack Gas Exit Velocity (m/s)[6]
		(mE)[2]	(mN)[3]					
CMPR	Compressor	382,116.1	5,072,070.1	2,256.5	3.8	0.16	776.48	52.22
CRSHR	Crusher	382,025.5	5,072,014.8	2,247.6	3.8	0.16	751.48	53.38
SCRN	Screen	382,041.0	5,072,014.4	2,248.9	3.8	0.09	819.26	48.29
GEN1	Generator	382,055.2	5,071,908.2	2,246.5	3.8	0.25	791.48	80.67

1. UTM NAD83 = Universal Transverse Mercator North American Datum 1983.
2. mE = meters Easting.
3. mN = meters Northing.
4. m = meters.
5. K = degrees Kelvin.
6. m/s = meters per second.

AERMOD MODELING RESULTS

The selected 1-hour NO_2 modeled concentration was the 5-year average of the 98th percentile of the annual distribution of the maximum daily 1-hour values daily maximum using the OLM. The selected annual NO_2 concentration was the highest arithmetic mean of the total NO_x (no conversion) and therefore, is considered a conservative estimation. Table 3 below summarizes the modeling results and indicates that the new NO_x emissions from the current permitting action would not violate the 1-hour or annual NO_2 NAAQS or MAAQS.

Table 3. BHJV NAAQS/MAAQS Compliance Results.

Pollutant	Averaging Period	Modeled Concentration (µg/m^3)	Background Concentration (µg/m^3)	Total Concentration (µg/m^3)	NAAQS (µg/m^3)	Percent of NAAQS (%)	MAAQS (µg/m^3)	Percent of MAAQS (%)
NO_2	1-Hour	168.3	15.04	183.3	188	97.5	564	32.5
	Annual	18.7	6	24.7	100	24.7	94	26.3

VII. Taking or Damaging Implication Analysis

As required by 2-10-105, MCA, the Department conducted the following private property taking and damaging assessment.

YES	NO	
X		1. Does the action pertain to land or water management or environmental regulation affecting private real property or water rights?
	X	2. Does the action result in either a permanent or indefinite physical occupation of private property?
	X	3. Does the action deny a fundamental attribute of ownership? (ex.: right to exclude others, disposal of property)
	X	4. Does the action deprive the owner of all economically viable uses of the property?
	X	5. Does the action require a property owner to dedicate a portion of property or to grant an easement? [If no, go to (6)].
		5a. Is there a reasonable, specific connection between the government requirement and legitimate state interests?
		5b. Is the government requirement roughly proportional to the impact of the proposed use of the property?
	X	6. Does the action have a severe impact on the value of the property? (consider economic impact, investment-backed expectations, character of government action)
	X	7. Does the action damage the property by causing some physical disturbance with respect to the property in excess of that sustained by the public generally?
	X	7a. Is the impact of government action direct, peculiar, and significant?
	X	7b. Has government action resulted in the property becoming practically inaccessible, waterlogged or flooded?
	X	7c. Has government action lowered property values by more than 30% and necessitated the physical taking of adjacent property or property across a public way from the property in question?
	X	Takings or damaging implications? (Taking or damaging implications exist if YES is checked in response to question 1 and also to any one or more of the following questions: 2, 3, 4, 6, 7a, 7b, 7c; or if NO is checked in response to questions 5a or 5b; the shaded areas)

Based on this analysis, the Department determined there are no taking or damaging implications associated with this permit action.

VIII. Environmental Assessment

An environmental assessment, required by the Montana Environmental Policy Act, was completed for this project. A copy is attached.

DEPARTMENT OF ENVIRONMENTAL QUALITY
Permitting and Compliance Division
Air Resources Management Bureau
P.O. Box 200901, Helena, Montana 59620
(406) 444-3490

FINAL ENVIRONMENTAL ASSESSMENT (EA)

Issued To: Butte Highlands Joint Venture

Montana Air Quality Permit Number: 4449-03

Preliminary Determination Issued: 9/27/11
Department Decision Issued: 10/13/11
Permit Final: 10/29/11

1. *Legal Description of Site*: Sections 31 and 32, Township 1 North, Range 7 West, in Silver Bow County, Montana.

2. *Description of Project*: the current project addresses the changes in operations from exploration activities to the mining of gold ore. The permit modification would include increases in daily and annual aggregate throughputs to 2,000 tons per day (730,000 TPY) of combined gold ore and production rock, the corresponding increases in activities associated with the increase in throughput (blasting, loading, unloading, and haul road traffic), the addition of a 150 TPH crusher powered by a 350-bhp diesel engine, a 500 TPH screen powered by a 100-bhp diesel engine, a new generator powered by a 1,502-bhp diesel engine, an upgraded air compressor powered by a 540-bhp diesel engine, and two 15,000 gallon diesel storage tanks. Equipment that would be removed from the permit are a 275-bhp diesel engine from the old air compressor and an 8,000 gallon diesel storage tank that had been included in the original permit but had never been installed.

3. *Objectives of Project*: the objectives of this project are to enter the production stage of the BHJV mine development. The facility began as an underground exploration project consisting of drifting, ore recovery for bulk sampling, and development rock removal and storage. Now the project is transitioning to the mining of gold ore and would therefore require additional aggregate throughput capacity as well as upgrades to some equipment. No extraction of gold from the ore would take place at BHJV. Gold ore would be transported offsite by haul trucks to a separate processing facility for gold extraction.

4. *Alternatives Considered*: In addition to the proposed action, the Department also considered the "no-action" alternative. The "no-action" alternative would deny issuance of the air quality preconstruction permit to the proposed facility. However, the Department does not consider the "no-action" alternative to be appropriate because BHJV demonstrated compliance with all applicable rules and regulations as required for permit issuance. Therefore, the "no-action" alternative was eliminated from further consideration.

5. *A Listing of Mitigation, Stipulations, and Other Controls*: A list of enforceable conditions, including a BACT analysis, would be included in MAQP #4449-03.

6. *Regulatory Effects on Private Property*: The Department considered alternatives to the conditions imposed in this permit as part of the permit development. The Department determined that the permit conditions are reasonably necessary to ensure compliance with applicable requirements and demonstrate compliance with those requirements and do not unduly restrict private property rights.

7. *The following table summarizes the potential physical and biological effects of the proposed project on the human environment. The "no-action" alternative was discussed previously.*

		Major	Moderate	Minor	None	Unknown	Comments Included
A	Terrestrial and Aquatic Life and Habitats			X			Yes
B	Water Quality, Quantity, and Distribution			X			Yes
C	Geology and Soil Quality, Stability and Moisture			X			Yes
D	Vegetation Cover, Quantity, and Quality			X			Yes
E	Aesthetics			X			Yes
F	Air Quality			X			Yes
G	Unique Endangered, Fragile, or Limited Environmental Resources			X			Yes
H	Demands on Environmental Resource of Water, Air and Energy			X			Yes
I	Historical and Archaeological Sites			X			Yes
J	Cumulative and Secondary Impacts			X			Yes

SUMMARY OF COMMENTS ON POTENTIAL PHYSICAL AND BIOLOGICAL EFFECTS: The following comments have been prepared by the Department.

A. Terrestrial and Aquatic Life and Habitats

This permitting action would have a minor effect on terrestrial and aquatic life and habitats in the project area. There would be an increase in air emissions from the facility which could increase the deposition of pollutants within the terrestrial and aquatic life habitats. The Department has determined that any impacts would be minor due to the dispersion characteristics of the pollutants, the atmosphere, and conditions that would be placed in MAQP #4449-03.

B. Water Quality, Quantity and Distribution

This project would have a minor effect on the water quality, quantity, and distribution due to the use of water for fugitive dust suppression. Water would be required for fugitive dust suppression in the surface activities including the proposed crushing and screening operations. Typical application of water spray for dust suppression results in the water being evaporated to the atmosphere shortly after its application. Therefore, any effects to the water quality, quantity, and distribution would be minor.

C. Geology and Soil Quality, Stability and Moisture

The project would have a minor effect on the geology and soil quality, stability, and moisture from the increase in mining production. The impacts from emissions or deposition of pollutants would be minor due to dispersion characteristics of the pollutants, the atmosphere, and the conditions that would be placed in MAQP #4449-03.

D. Vegetation Cover, Quantity, and Quality

The project would have a minor affect on the local vegetation. The impacts from emissions or deposition of pollutants would be minor due to dispersion characteristics of the pollutants, the atmosphere, and the conditions that would be placed in MAQP #4449-03. Reclaimed areas would be seeded with native seed mixture and would be applied in the late fall or early spring to reduce the invasion of noxious weeds.

E. Aesthetics

The proposed project would have a minor effect on the local aesthetics. There will be additional equipment added to the worksite. There are potential visual emissions associated with the proposed crushing and screening operations. However, conditions would be placed in MAQP #4449-03 to limit visible emissions.

F. Air Quality

The area surrounding the proposed project is unclassifiable/attainment for the NAAQS for all criteria air pollutants. The proposed site location is not in or within 10 kilometers of the Butte PM_{10} nonattainment area. The Department believes that concentrations of the criteria pollutants in the area are at or near background levels and well below any NAAQS levels. An increase in emissions of air pollutants would occur as a result of the current permit action. BHJV demonstrated with ambient air modeling that the proposed new equipment would not cause or contribute to violations of the NO_2 NAAQS and MAAQS. MAQP #4449-03 would contain conditions limiting opacity and diesel generator operations and require, as necessary, the use of water, chemical dust suppressants, or water spray bars to control dust from vehicle traffic and process equipment. Compliance with all applicable permit requirements would ensure that the effects would be minor.

G. Unique Endangered, Fragile, or Limited Environmental Resources

The proposed permitting action would have a minor impact on the unique endangered, fragile, or limited environmental resources because emissions of PM_{10}, NO_x, CO, VOC, and SO_2 would increase in the area from the operation of the new equipment. However, the Department believes that any impacts would be minor due to the relatively small amount of the above listed pollutants emitted, dispersion characteristics of the pollutants and the atmosphere, and conditions placed in MAQP #4449-03, including, but not limited to, BACT requirements discussed in Section V of the permit analysis for this permit.

During the initial permit application for the BHJV project, the Montana Natural Heritage Program (MNHP) identified occurrences of 12 plant and animal species of concern within the vicinity of the proposed project location. The Canada lynx is a threatened species of concern identified by the MNHP with the remaining species of concern being classified as sensitive or without classification. Sensitive animal species of concern are the Brewer's Sparrow, Westslope Cutthroat Trout, Gray Wolf, and Wolverine. Sensitive plant species of concern are the Sapphire Rockcress, Small-flowered Pennycress, Lemhi Beardtongue, and Hall's Rush. Unclassified animals are the Grasshopper Sparrow and Black Rosy-Finch. The unclassified plant is the Slender Fleabane.

H. Demands on Environmental Resource of Water, Air and Energy

The current permitting action would have a minor impact on the environmental resources of water, air, and energy. Water will be required for fugitive dust suppression. Electrical energy for the project would be provided by diesel-fired generator/engines. Line power is available near the site; however, this line does not have sufficient power to support all the exploration activities.

I. Historical and Archaeological Sites

The proposed project would involve the disturbance of 76 acres. The Department contacted the Montana Historical Society, State Historical Preservation Office (SHPO) during the initial permitting for the BHJV project in an effort to identify any historical and archaeological sites that may be present in the area of operation. Search results concluded that there are several previously recorded sites near the designated project area. The proposed site is in the area of the historic Highland Mine; however, few if any of the original structures remain and the proposed new portal and waste rock dump would not be located near the historic shafts and adits.

J. Cumulative and Secondary Impacts

Overall, the cumulative and secondary impacts from this project on the physical and biological environment in the immediate area would be minor because this permitting action adds equipment to an existing facility. The Department believes that this facility could be expected to operate in compliance with all applicable rules and regulations as outlined in MAQP #4449-03. BHJV has demonstrated through an ambient air modeling analysis that the potential emissions expected from operating the facility at its maximum throughput on a continuous basis would not violate ambient air quality standards. Therefore, the MAQP is written to reflect the expected emissions from operating continuously at the maximum rate. BHJV may be restricted on annual throughput by other government jurisdictions which would limit ore production to a level less than described in the MAQP.

8. *The following table summarizes the potential economic and social effects of the proposed project on the human environment. The "no-action" alternative was discussed previously.*

		Major	Moderate	Minor	None	Unknown	Comments Included
A	Social Structures and Mores				X		Yes
B	Cultural Uniqueness and Diversity				X		Yes
C	Local and State Tax Base and Tax Revenue			X			Yes
D	Agricultural or Industrial Production			X			Yes
E	Human Health			X			Yes
F	Access to and Quality of Recreational and Wilderness Activities			X			Yes
G	Quantity and Distribution of Employment				X		Yes
H	Distribution of Population				X		Yes
I	Demands for Government Services			X			Yes
J	Industrial and Commercial Activity			X			Yes
K	Locally Adopted Environmental Plans and Goals				X		Yes
L	Cumulative and Secondary Impacts			X			Yes

SUMMARY OF COMMENTS ON POTENTIAL ECONOMIC AND SOCIAL EFFECTS: The following comments have been prepared by the Department.

A. Social Structures and Mores
B. Cultural Uniqueness and Diversity

The current permitting action would have no impact on the social structures and mores and cultural diversity and uniqueness because the action increases production limits and adds equipment to an existing facility. There would be no change to the nature of the operations due to this permitting action.

C. Local and State Tax Base and Tax Revenue

The project would have a minor effect on the local and state tax base and revenue due to the taxes generated from the purchase of supplies to support the new equipment. There are no planned increases in employees associated with this project.

D. Agricultural or Industrial Production

The project would result in a minor impact to the agricultural production because additional potential grazing land will be cleared for the project. A fence would be constructed around the ventilation raise upon its completion to secure this mine entry consistent with mining safety regulations. In addition to providing security, this would also prevent cattle from grazing in the enclosed area. Industrial production would be increased by the proposed project due to increased production rates at the mine.

E. Human Health

There would be minor effects on human health due to the slight increase in emissions of air pollutants. However, MAQP #4449-03 incorporates conditions to ensure that the facility would be operated in compliance with all applicable rules and standards. These rules and standards are designed to be protective of human health. BHJV has demonstrated with ambient air modeling that emissions from the proposed project would not violate any ambient air quality standards which are protective of human health. In addition, the project would occur in a remote area with limited population; therefore, effects on human health would be minor.

F. Access to and Quality of Recreational and Wilderness Activities

The project would not have an impact to the access to recreational and wilderness activities because no road closures will occur and the site would be located on private property. The project would have a minor impact on the quality of recreational and wilderness activities due to the slight increase in emissions of air pollutants and the noise generated by the equipment.

G. Quantity and Distribution of Employment
H. Distribution of Population

The project would not have an impact on the quantity and distribution of employment or population because no new employees are expected to be hired and there are no plans to house workers onsite.

I. Demands for Government Services

Government services would be required for acquiring the appropriate permits from government agencies. In addition, the permitted source of emissions would be subject to periodic inspections by government personnel. The project would use existing roads to access the site. Demands for government services would be minor.

J. Industrial and Commercial Activity

The project would have a minor impact on industrial and commercial activity from the increase in production at the facility.

K. Locally Adopted Environmental Plans and Goals

The Department is not aware of any locally adopted environmental plans or goals. The state standards would protect the proposed site and the environment surrounding the site. The proposed project location is outside of the Butte PM_{10} nonattainment area and no effects to the nonattainment area are expected from this project.

L. Cumulative and Secondary Impacts

Overall, cumulative and secondary impacts from this project would result in minor impacts to the economic and social environment in the immediate area. As previously stated, the proposed project would result in a slight increase in industrial process in the area. The Department believes that BHJV would be expected to operate in compliance with all applicable rules and regulations as outlined in MAQP #4449-03.

Recommendation: No Environmental Impact Statement (EIS) is required.

If an EIS is not required, explain why the EA is an appropriate level of analysis: The current permitting action is for the construction and operation of underground gold ore mine. MAQP #4449-03 includes conditions and limitations to ensure the facility will operate in compliance with all applicable rules and regulations. In addition, there are no significant impacts associated with this proposal.

Other groups or agencies contacted or which may have overlapping jurisdiction: Montana Historical Society – State Historic Preservation Office, Natural Resource Information System – Montana Natural Heritage Program, Montana Department of Environmental Quality – Hard Rock Mining Program.

Individuals or groups contributing to this EA: Department of Environmental Quality – Air Resources Management Bureau, Montana Historical Society – State Historic Preservation Office, Natural Resource Information System – Montana Natural Heritage Program.

EA prepared by: Ed Warner
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